

**Final**

**Site Investigation Report**  
**Small Weapons Storage and Cleaning Compound**  
**Building 1378, Parcel 174(7)**

**Fort McClellan**  
**Calhoun County, Alabama**

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**Task Order CK05**  
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## ***List of Acronyms***

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See Attachment 1 – List of Abbreviations and Acronyms.

## ***Executive Summary***

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In accordance with Contract Number DACA21-96-D-0018, Task Order CK05, IT Corporation (IT) completed a site investigation (SI) at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), at Fort McClellan (FTMC) in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site, and, if present, whether the concentrations present an unacceptable risk to human health or the environment.

The SI at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), consisted of the sampling and analysis of four surface soil samples, one depositional soil sample, four subsurface soil samples, two groundwater samples, two surface water samples, and two sediment samples. In addition, two temporary monitoring wells were installed in the saturated zone to facilitate groundwater sample collection and provide site-specific geological and hydrogeological characterization information.

Chemical analyses of samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), indicate that metals, volatile organic compounds, and semivolatile organic compounds (SVOC) were detected in the environmental media sampled. To evaluate whether the detected constituents present an unacceptable risk to human health or the environment, the analytical results were compared to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC.

The potential threat to human receptors is expected to be low. Although the site is projected to be transferred to the Alabama Army National Guard, the soils and groundwater data were screened against residential human health SSSLs to evaluate the site for possible unrestricted land reuse. In soils, the concentrations of aluminum (two subsurface soil samples) and iron (two surface/depositional soil samples) exceeded SSSLs and their respective background concentrations. In groundwater, the concentrations of manganese and iron exceeded SSSLs and their respective background concentrations. However, the concentrations of these metals were within the range of background values determined by SAIC (1998) and do not pose an unacceptable risk to human health. The PAH compound benzo(a)pyrene was detected in four surface/depositional soil samples at concentrations exceeding its SSSL but below the PAH background value. VOC concentrations in site media were below SSSLs.

Five metals (arsenic, iron, selenium, silver, and zinc) were detected in site media at concentrations exceeding ESVs and their respective background concentrations. However, with the exception of silver and selenium in surface and depositional soils, the concentrations of these

metals were within the range of background values determined by the SAIC (1998). Three PAH compounds were detected in surface/depositional soil samples at concentrations exceeding ESVs but below PAH background values. The site is located within a well-developed area of the Main Post, consisting of buildings, gravel-covered areas, and roads, interspersed with limited grassy areas. Viable ecological habitat is presently limited and is not expected to increase in the future land use scenario. Based on the low levels of metals, volatile organic compounds, and SVOCs detected and the future land use of this site, the potential threat to ecological receptors is expected to be low.

Based on the results of the SI, past operations at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), do not appear to have adversely impacted the environment. The metals and chemical constituents detected in site media do not pose an unacceptable risk to human health and the environment. Therefore, IT recommends “No Further Action” and unrestricted land reuse at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7).



## **1.0 Introduction**

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The U.S. Army has selected Fort McClellan (FTMC) located in Calhoun County, Alabama, for closure by the Base Realignment and Closure (BRAC) Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act, Public Law 101-510, established the process by which U.S. Department of Defense (DOD) installations would be closed or realigned. The BRAC Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. The U.S. Army is conducting environmental studies of the impact of suspected contaminants at parcels at FTMC under the management of the U.S. Army Corps of Engineers (USACE), Mobile District. The USACE contracted with IT Corporation (IT) to perform the site investigation (SI) at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), under Contract Number DACA21-96-D-0018, Task Order CK05.

This SI report presents specific information and results compiled from the SI, including field sampling and analysis and monitoring well installation activities, conducted at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7).

### **1.1 Project Description**

The Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), was identified as an area to be investigated prior to property transfer. The site was classified as a Category 7 site in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 sites are areas that are not evaluated and/or that require further evaluation.

A site-specific field sampling plan (SFSP) attachment (IT, 1998a) and a site-specific safety and health plan (SSHP) attachment were finalized in November 1998. The SFSP and SSHP were prepared to provide technical guidance for sample collection and analysis at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). The SFSP was used in conjunction with the SSHP as attachments to the installation-wide work plan (IT, 1998b), and the installation-wide sampling and analysis plan (SAP) (IT, 2000a). The SAP includes the installation-wide safety and health plan and quality assurance plan.

The SI included fieldwork to collect four surface soil samples, one depositional soil sample, four subsurface soil samples, two groundwater samples, two surface water samples, and two sediment samples. Data from the field investigation were used to determine whether potential site-specific

chemicals are present at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7).

## **1.2 Purpose and Objectives**

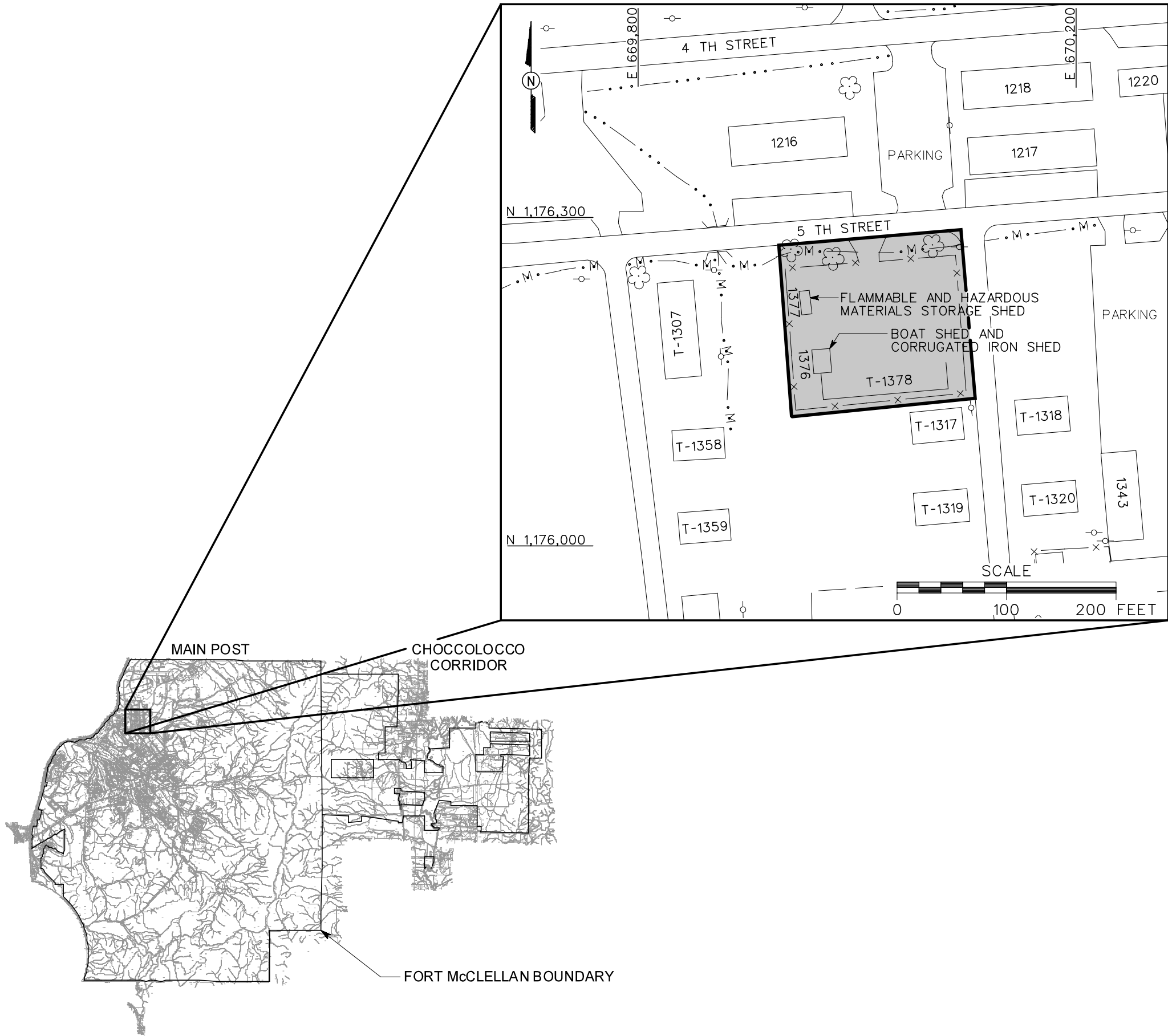
The SI program was designed to collect data from site media and provide a level of defensible data and information in sufficient detail to determine whether chemical constituents are present at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), at concentrations that present an unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0 are based on the comparison of the analytical results to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC. The SSSLs and ESVs were developed by IT as part of the human health and ecological risk evaluations associated with SIs being performed under the BRAC Environmental Restoration Program at FTMC. The SSSLs, ESVs, and polynuclear aromatic hydrocarbon (PAH) background screening values are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). The PAH background screening values were developed by IT at the direction of the BRAC Cleanup Team to address the occurrence of PAH compounds in surface soils as a result of anthropogenic activities at FTMC. Background metals screening values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation [SAIC], 1998).

Based on the conclusions presented in this SI report, the BRAC Cleanup Team will decide either to propose “No Further Action” at the site or to conduct additional work at the site.

## **1.3 Site Description and History**

The Small Weapons Storage and Cleaning Compound, Parcel 174(7), is located on 5th Street in the northwest part of the FTMC Main Post (Figure 1-1). The compound was built in 1978 and was originally used for boat storage, but was redesigned for weapons cleaning in the late 1980s. The site consists of three storage buildings: a small corrugated iron shed (Building 1376), a small flammable and hazardous materials storage building (Building 1377), and a boat shed (Building 1378). The approximately 1-acre compound is covered with gravel, the entire area is fenced, and access is restricted (Figure 1-2). The site is managed by the Alabama Army National Guard.

The small flammable and hazardous materials storage building (Building 1377) is located on the northwest portion of the compound. Hazardous materials (lubricants) were stored in the building in quantities reportedly below Comprehensive Environmental Response, Compensation, and Liability Act reportable quantities. A small storage shed (Building 1376) is located on the



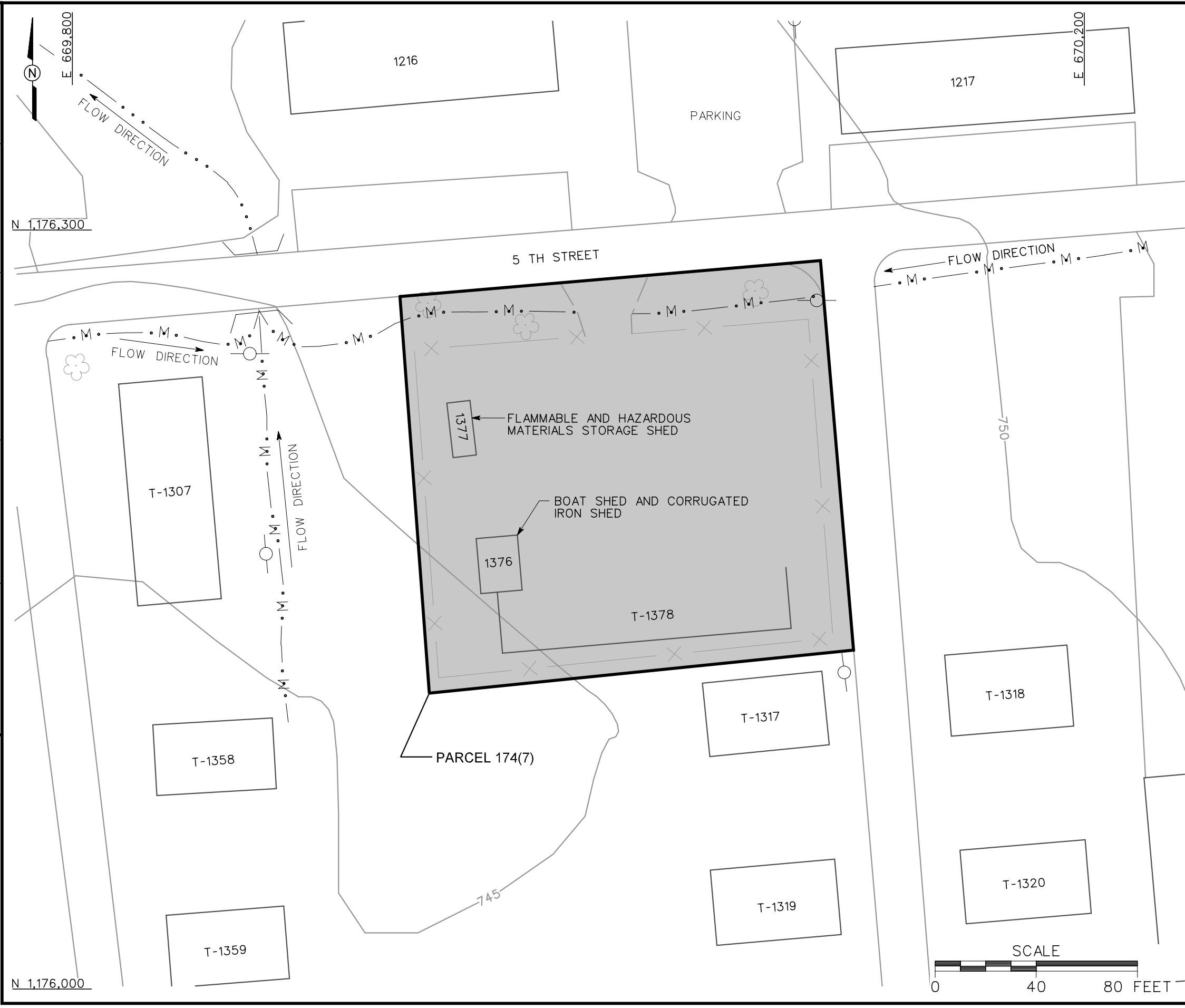
LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TREES / TREELINE
- PARCEL BOUNDARY
- CULVERT WITH HEADWALL
- SURFACE DRAINAGE / CREEK
- MANMADE SURFACE DRAINAGE FEATURE
- FENCE
- UTILITY POLE

FIGURE 1-1  
SITE LOCATION MAP  
SMALL WEAPONS STORAGE AND  
CLEANING COMPOUND, BUILDING 1378  
PARCEL 174(7)

U. S. ARMY CORPS OF ENGINEERS  
MOBILE DISTRICT  
FORT McCLELLAN  
CALHOUN COUNTY, ALABAMA  
Contract No. DACA21-96-D-0018

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- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FEET)
- TREES / TREELINE
- PARCEL BOUNDARY
- CULVERT WITH HEADWALL
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE

**FIGURE 1-2**  
**SITE MAP**  
**SMALL WEAPONS STORAGE AND**  
**CLEANING COMPOUND, BUILDING 1378**  
**PARCEL 174(7)**

U. S. ARMY CORPS OF ENGINEERS  
MOBILE DISTRICT  
FORT McCLELLAN  
CALHOUN COUNTY, ALABAMA  
Contract No. DACA21-96-D-0018



southwest part of the compound and was kept locked at all times. Small-caliber weapons were stripped and cleaned on tables that were temporarily placed in Building 1378. Weapons were not cleaned anywhere else within the compound. Weapons were cleaned using Safety Kleen™ solution. The chemicals used for cleaning activities were stored in the locked corrugated iron shed on site. A subcontractor for Army (Safety Kleen, Inc.) disposed of used chemicals. Although the EBS states that small-caliber weapons were stored at the site, evidence during a site visit and communication with Alabama Army National Guard personnel indicate that buildings at the site are not used for weapons storage. There have not been any reported releases at the site (ESE, 1998).

Site elevation at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), is approximately 750 feet above mean sea level. Surface drainage at the site follows the topography and flows to the west-northwest into manmade surface drainage features along the northern and western boundaries of the site.

## **2.0 Previous Investigations**

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An EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The study was to identify sites that, based on available information, have no history of contamination and comply with DOD guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by seven criteria:

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas)
2. Areas where only release or disposal of petroleum products has occurred
3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response
4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken
5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken
6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented
7. Areas that are not evaluated or require additional evaluation.

The EBS was conducted in accordance with Community Environmental Response Facilitation Act (CERFA-Public Law 102-426) protocols and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, the Alabama Department of Environmental Management (ADEM), the U.S. Environmental Protection Agency (EPA) Region IV, and Calhoun County, as well as a database search of Comprehensive Environmental Response, Compensation, and Liability Act-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historical maps and aerial photographs were reviewed to document historical land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

The Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), was identified as a CERFA Category 7 site: areas that are not evaluated and/or that require additional evaluation.

## **3.0 Current Site Investigation Activities**

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This chapter summarizes SI activities conducted by IT at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), including environmental sampling and analysis and groundwater monitoring well installation activities.

### **3.1 Environmental Sampling**

The environmental sampling performed during the SI at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), included the collection of surface and depositional soil samples, subsurface soil samples, groundwater samples, surface water samples, and sediment samples for chemical analysis. The sample locations were determined by observing site physical characteristics during a site visit and by reviewing historical documents pertaining to activities conducted at the site. The sample locations, media, and rationale are summarized in Table 3-1. Sampling locations are shown on Figure 3-1. Samples were submitted for laboratory analysis of site-related parameters listed in Section 3.3.

#### **3.1.1 Surface and Depositional Soil Sampling**

Surface soil samples were collected from four locations and a depositional soil sample was collected from one location at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). Soil sampling locations and rationale are presented in Table 3-1. Sampling locations are shown on Figure 3-1. Sample designations and quality assurance/quality control (QA/QC) samples are listed in Table 3-2. Soil sampling locations were determined in the field by the on-site geologist based on the sampling rationale, presence of surface structures, site topography, and buried utilities.

**Sample Collection.** Surface and depositional soil samples were collected from the upper 1 foot of soil with a 3-inch diameter stainless-steel hand auger using the methodology specified in Section 4.9.1.1 of the SAP (IT, 2000a). Surface and depositional soil samples were collected by first removing surface debris, such as asphalt, rocks and vegetation, from the immediate sample area. The soil was collected with the sampling device and screened with a photoionization detector (PID) in accordance with Section 4.7.1.1 of the SAP (IT, 2000a). Samples for volatile organic compound (VOC) analysis were collected directly from the sampler with three EnCore<sup>®</sup> samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.3. Sample collection logs are included in Appendix A.

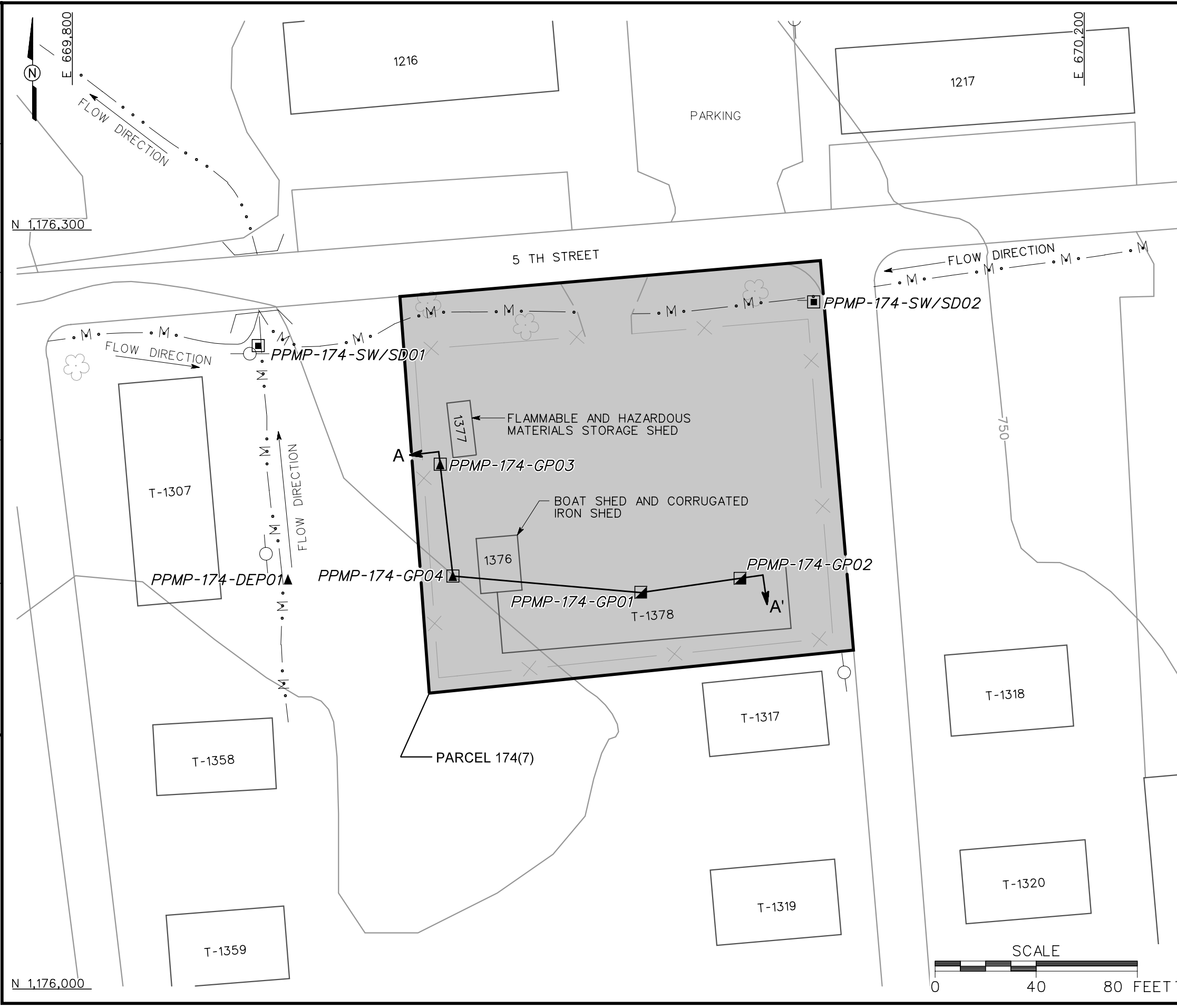


**Table 3-1**

**Sampling Locations and Rationale  
Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)  
Fort McClellan, Calhoun County, Alabama**

<b>Sample Location</b>	<b>Sample Media</b>	<b>Sample Location Rationale</b>
PPMP-174-GP01	Surface Soil Subsurface Soil	Surface soil and subsurface soil samples were collected from the small weapons cleaning area southeast of the corrugated iron shed.
PPMP-174-GP02	Surface Soil Subsurface Soil	Surface soil and subsurface soil samples were collected from the small weapons cleaning area near the boat shed on the southeast corner of the parcel
PPMP-174-GP03	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil, and groundwater samples were collected near the southwest corner of the hazardous material and flammable storage shed (Building 1377).
PPMP-174-GP04	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil, and groundwater samples were collected from the immediate vicinity (west) of the corrugated iron shed (Building 1376).
PPMP-174-SW/SD01	Surface Water Sediment	Surface water and sediment samples were collected from a downgradient sink (ditch) near the northwest corner of the parcel.
PPMP-174-SW/SD02	Surface Water Sediment	Surface water and sediment samples were collected from an upgradient location south of 5th Street near the northeast corner of the parcel.
PPMP-174-DEP01	Depositional Soil	A depositional soil sample was collected downstream (west) of the corrugated iron shed.

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- LEGEND**
- UNIMPROVED ROADS AND PARKING
  - PAVED ROADS AND PARKING
  - BUILDING
  - TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FEET)
  - TREES / TREELINE
  - PARCEL BOUNDARY
  - CULVERT WITH HEADWALL
  - SURFACE DRAINAGE / CREEK
  - FENCE
  - UTILITY POLE
  - SURFACE WATER/SEDIMENT SAMPLE LOCATION
  - SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
  - GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
  - DEPOSITIONAL SOIL SAMPLE LOCATION
  - CROSS SECTION LOCATION

**FIGURE 3-1**  
**SAMPLE LOCATION MAP**  
**SMALL WEAPONS STORAGE AND**  
**CLEANING COMPOUND, BUILDING 1378**  
**PARCEL 174(7)**

U. S. ARMY CORPS OF ENGINEERS  
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FORT McCLELLAN  
CALHOUN COUNTY, ALABAMA  
Contract No. DACA21-96-D-0018

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Table 3-2

**Surface, Subsurface, and Depositional Soil Sample Designations and QA/QC Samples  
Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)  
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Designation	Sample Depth (ft. bgs)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
PPMP-174-GP01	PPMP-174-GP01-SS-KU0001-REG PPMP-174-GP01-DS-KU0002-REG	0-1 9-12				TCL VOCs, TCL SVOCs, TAL Metals
PPMP-174-GP02	PPMP-174-GP02-SS-KU0003-REG PPMP-174-GP02-DS-KU0004-REG	0-1 6-9			PPMP-174-GP02-SS-KU0003-MS PPMP-174-GP02-SS-KU0003-MSD	TCL VOCs, TCL SVOCs, TAL Metals
PPMP-174-GP03	PPMP-174-GP03-SS-KU0005-REG PPMP-174-GP03-DS-KU0008-REG	0-1 1-3	PPMP-174-GP03-SS-KU0006-FD	PPMP-174-GP03-SS-KU0007-FS		TCL VOCs, TCL SVOCs, TAL Metals
PPMP-174-GP04	PPMP-174-GP04-SS-KU0009-REG PPMP-174-GP04-DS-KU0010-REG	0-1 6-9				TCL VOCs, TCL SVOCs, TAL Metals
PPMP-174-DEP01	PPMP-174-DEP01-DEP-KU0011-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals

FD - Field duplicate.

FS - Field split.

ft. bgs - feet below ground surface.

MS/MSD - Matrix spike/matrix spike duplicate.

QA/QC - Quality assurance/quality control.

SVOC - Semivolatile organic compound.

TAL - Target analyte list.

TCL - Target compound list.

VOC - Volatile organic compound.

### **3.1.2 Subsurface Soil Sampling**

Subsurface soil samples were collected from four soil borings at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), as shown on Figure 3-1. Subsurface soil sampling locations and rationale are presented in Table 3-1. Subsurface soil sample designations, depths, and QA/QC samples are listed in Table 3-2. Soil boring sampling locations were determined in the field by the on-site geologist based on the sampling rationale, presence of surface structures, site topography, and buried and overhead utilities. IT contracted TEG, Inc., a direct-push technology subcontractor, to assist in subsurface soil sample collection.

**Sample Collection.** Subsurface soil samples were collected from soil borings at depths greater than 1 foot below ground surface (bgs) in the unsaturated zone. The soil borings were advanced and samples collected using the direct-push sampling procedures specified in Section 4.9.1.1 of the SAP (IT, 2000a). Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.3.

Subsurface soil samples were collected continuously to 12 feet bgs or until direct-push sampler refusal was encountered. Samples were field screened using a PID in accordance with Section 4.7.1.1 of the SAP (IT, 2000a) to measure for volatile organic vapors. The sample displaying the highest reading was selected and sent to the laboratory for analysis; however, at those locations where PID readings were not greater than background, the deepest sample interval above the saturated zone was submitted for analysis. Samples to be analyzed for VOCs were collected directly from the sampler with three EnCore samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. Samples submitted for laboratory analysis are summarized in Table 3-2. The on-site geologist constructed a detailed boring log for each soil boring. The boring logs are included in Appendix B. At the completion of soil sampling, boreholes were abandoned with bentonite pellets and hydrated with potable water, following borehole abandonment procedures summarized in Appendix B of the SAP (IT, 2000a).

### **3.1.3 Well Installation**

Two temporary wells were installed in the saturated zone at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), to collect groundwater samples for laboratory analysis. The well locations are shown on Figure 3-1. Table 3-3 summarizes construction details of the wells installed at the Small Weapons Storage and Cleaning

**Table 3-3**

**Temporary Well Construction Summary  
Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)  
Fort McClellan, Calhoun County, Alabama**

<b>Well Location</b>	<b>Northing</b>	<b>Easting</b>	<b>Ground Elevation (ft msl)</b>	<b>TOC Elevation (ft msl)</b>	<b>Well Depth (ft bgs)</b>	<b>Screen Length (ft)</b>	<b>Screen Interval (ft bgs)</b>	<b>Well Material</b>
PPMP-174-GP03	1176206.77	669946.07	746.52	749.11	20	15	4.75 - 19.75	2" ID Sch. 40 PVC
PPMP-174-GP04	1176162.58	669951.09	746.70	746.57	15	10	4.75 - 14.75	2" ID Sch. 40 PVC

Temporary wells installed with an auger drill rig using a 4.25-inch inside diameter hollow-stem, auger.

Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983 (NAD83).

Elevation were referenced to the North American Vertical Datum of 1988 (NAVD88).

2" ID Sch. 40 PVC - 2-inch inside diameter, Schedule 40, polyvinyl chloride.

bgs- Below ground surface.

ft- Feet

msl - Mean sea level.

TOC- Top of casing.

Compound, Building 1378, Parcel 174(7). The well construction logs are included in Appendix B.

IT contracted Miller Drilling Inc. to install the temporary wells with a hollow-stem auger rig at the locations shown on Figure 3-1. The wells were installed following procedures outlined in Section 4.7 and Appendix C of the SAP (IT, 2000a). The boreholes at these locations were advanced with a 4.25-inch inside diameter (ID) hollow-stem auger from ground surface to the saturated zone. The borehole was augured to the depth of direct-push sampler refusal and samples were collected from the depth of direct-push refusal to the bottom of the borehole. A 2-foot-long, 2-inch ID carbon steel split-spoon sampler was driven at 5-foot intervals to collect residuum for observing and describing lithology. Where split-spoon refusal was encountered, the auger was advanced until the first water-bearing zone was encountered. The on-site geologist logging the auger boreholes continued the lithological log for each borehole from the depth of split-spoon sampler refusal to the bottom of the auger borehole by logging the auger drill cuttings. The drill cuttings were logged to determine lithologic changes and the approximate depth of groundwater encountered during drilling. This information was used to determine the optimal placement of the monitoring well screen interval and to provide site-specific geologic and hydrogeologic information. The boring log for each borehole is included in Appendix B.

Upon reaching the target depth, a 10- or 15-foot length of 2-inch ID, 0.010-inch factory slotted, Schedule 40 polyvinyl chloride (PVC) screen with a 3-inch PVC end cap was placed through the auger to the bottom of the borehole. The screen and end cap were attached to 2-inch ID, flush-threaded Schedule 40 PVC riser. A sand pack consisting of a number 1 filter sand (environmentally safe, clean fine sand, sieve size 20 to 40) was tremied around the well screen to approximately 2 feet above the top of the well screen as the augers were removed. The wells were surged using a solid PVC surge block for approximately 10 minutes, or until no more settling of the filter sand occurred inside the borehole. A bentonite seal, consisting of approximately 2 feet of bentonite pellets, was placed immediately on top of the sand pack and hydrated with potable water. If the bentonite seal was installed below the water table surface, the bentonite pellets were allowed to hydrate in the groundwater. The bentonite seal placement and hydration followed procedures in Appendix C of the SAP (IT, 2000a). A locking well cap was placed on the PVC well casing. The temporary well surface completion included attaching plastic sheeting around the PVC riser using duct tape. Additionally, sand bags were used to secure the sheeting to the ground surface around the temporary well.

The temporary wells were developed by surging and pumping with a 2-inch diameter submersible pump in accordance with methodology outlined in Section 4.8 and Appendix C of

the SAP (IT, 2000a). The submersible pump used for well development was moved in an up-and-down fashion to encourage any residual well installation materials to enter the well. These materials were then pumped out of the well in order to re-establish the natural hydraulic flow conditions. Development was performed until the water turbidity was less than or equal to 20 nephelometric turbidity units (NTU) or for a maximum of 4 hours. The well development logs are included in Appendix C.

#### **3.1.4 Water Level Measurements**

The depth to groundwater was measured in all temporary, permanent, and existing monitoring wells installed at FTMC on March 13 and 14, 2000, following procedures outlined in Section 4.18 of the SAP (IT, 2000a). Depth to groundwater was measured with an electronic water level meter. Each meter probe and cable were cleaned before use at each well following decontamination methodology presented in Section 4.10 of the SAP (IT, 2000a). Measurements were referenced to the top of the PVC well casing. A summary of groundwater level measurements is presented in Table 3-4.

#### **3.1.5 Groundwater Sampling**

Groundwater samples were collected from the two temporary wells installed at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). The groundwater sampling locations are shown on Figure 3-1. The groundwater sampling locations and rationale are listed in Table 3-1. The groundwater sample designations and QA/QC samples are listed in Table 3-5.

**Sample Collection.** Groundwater sampling was performed following procedures outlined in Section 4.9.1.4 of the SAP (IT, 2000a). Groundwater was sampled after purging a minimum of three well volumes and after field parameters (i.e., temperature, pH, specific conductivity, oxidation-reduction potential, and turbidity) stabilized. Purging and sampling were performed with a submersible pump equipped with Teflon® tubing. Field parameters were measured using a calibrated water quality meter. Field parameter readings are summarized in Table 3-6. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-5 using methods outlined in Section 3.3.

#### **3.1.6 Surface Water Sampling**

Two surface water samples were collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). Surface water sample locations are shown on Figure 3-1. The surface water sampling locations and rationale are listed in Table 3-1. The surface

**Table 3-4**

**Groundwater Elevations  
Small Weapons Storage and Cleaning Compound  
Building 1378, Parcel 174(7) and Vicinity  
Fort McClellan, Calhoun County, Alabama**

<b>Well Location</b>	<b>Date</b>	<b>Depth to Groundwater (ft BTOC)</b>	<b>Top of Casing Elevation (ft msl)</b>	<b>Ground Elevation (ft msl)</b>	<b>Groundwater Elevation (ft msl)</b>
<b>Parcel 174(7)</b>					
PPMP-174-GP03	14-Mar-00	4.75	749.11	746.52	744.36
PPMP-174-GP04	14-Mar-00	2.58	746.57	746.70	743.99
<b>Parcel 148(7)</b>					
FTA-148-GP01	14-Mar-00	4.18	756.15	754.93	751.97
FTA-148-GP02	14-Mar-00	7.13	751.31	750.51	744.18
FTA-148-GP08	14-Mar-00	4.37	761.21	760.09	756.84
FTA-148-GP11	14-Mar-00	3.75	753.91	752.06	750.16
FTA-148-GP13	14-Mar-00	2.62	753.05	751.59	750.43
<b>Parcel 143(7)</b>					
PPMP-143-GP03	14-Mar-00	6.23	761.99	762.04	755.76
PPMP-143-GP04	14-Mar-00	0.75	755.52	755.93	754.77
PPMP-143-GP05	14-Mar-00	4.48	758.82	757.16	754.34
<b>Parcel 502(7)</b>					
UST-502-MW01	14-Mar-00	7.60	743.71	743.95	736.11
UST-502-MW02	14-Mar-00	7.29	744.09	744.27	736.80
UST-502-MW03	14-Mar-00	9.25	744.23	744.45	734.98

Elevations referenced to the North American Vertical Datum of 1988 (NAVD88).

BTOC-Below top of casing.

ft- Feet

msl - Mean sea level.



**Table 3-5**

**Groundwater Sample Designations and QA/QC Samples  
Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)  
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Designation	QA/QC Samples			Analytical Suite
		Field Duplicates	Field Splits	MS/MSD	
PPMP-174-GP03	PPMP-174-GP03-GW-KU3001-REG	PPMP-174-GP03-GW-HU3002-FD	PPMP-174-GP03-GW-KU3003-FS		TCL VOCs, TCL SVOCs, TAL Metals
PPMP-174-GP04	PPMP-174-GP04-GW-KU3004-REG			PPMP-174-GP04-GW-KU3004-MS PPMP-174-GP04-GW-KU3004-MSD	TCL VOCs, TCL SVOCs, TAL Metals

Groundwater samples were collected from the approximate midpoint of the saturated screened interval of the monitoring well.

FD - Field duplicate

FS - Field split

ft. bgs - feet below ground surface

MS/MSD - Matrix spike/matrix spike duplicate.

QA/QC - Quality assurance/quality control.

SVOC - Semivolatile organic compound

TAL - Target analyte list.

TCL - Target compound list.

VOC - Volatile organic compound.

**Table 3-6**

**Groundwater and Surface Water Field Parameters  
Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)  
Fort McClellan, Calhoun County, Alabama**

<b>Sample Location</b>	<b>Media</b>	<b>Date</b>	<b>Specific Conductivity (mS/cm)<sup>a</sup></b>	<b>Dissolved Oxygen (mg/L)</b>	<b>ORP (mV)</b>	<b>Temperature (°C)</b>	<b>Turbidity (NTU)</b>	<b>pH (SU)</b>
PPMP-174-GP03	GW	24-Feb-99	2.283	0.90	-21.9	15.23	43.0	6.74
PPMP-174-GP04	GW	24-Feb-99	1.528	2.43	96.0	15.75	10.4	6.77
PPMP-174-SW/SD01	SW	27-Jan-99	0.462	11.00	0.0	18.27	13.0	7.82
PPMP-174-SW/SD02	SW	8-Feb-99	0.807	7.91	217.7	17.10	0.2	6.65

<sup>a</sup> Specific conductivity values standardized to millisiemens per centimeter.

°C - Degrees Celsius.

GW - Groundwater.

mg/L - Milligrams per liter.

mS/cm - Millisiemens per centimeter.

mV - Millivolts.

NTU - Nephelometric turbidity units.

ORP - Oxidation-reduction potential.

SU - Standard units.

SW - Surface water.

water sample designations and QA/QC samples are listed in Table 3-7. The sampling locations were determined in the field, based on drainage pathways and actual field observations.

**Sample Collection.** Surface water samples were collected in accordance with the procedures specified in Section 4.9.1.3 of the SAP (IT, 2000a). The samples were collected by dipping a stainless-steel pitcher in the water and pouring the water into the appropriate sample containers. The samples were collected after the field parameters described in Section 3.1.5 had been measured using a calibrated water quality meter. The field parameter readings are presented in Table 3-6. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.3.

### **3.1.7 Sediment Sampling**

Two sediment samples were collected at the same locations as the surface water samples discussed in Section 3.1.6 (Figure 3-1). The sediment sampling locations and rationale are listed in Table 3-1. The sediment sample designations are listed in Table 3-7. The sampling locations were determined in the field, based on drainage pathways and actual field observations.

**Sample Collection.** Sediment samples were collected in accordance with the procedures outlined in Section 4.9.1.2 of the SAP (IT, 2000a). Sediments were collected with a stainless-steel spoon and placed in a clean stainless-steel bowl. Samples for VOC analysis were then immediately collected from the stainless-steel bowl with three Encore samplers. The remaining portion of the sample was homogenized and placed in the appropriate sample containers. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.3.

## **3.2 Surveying of Sample Locations**

Sample locations were surveyed using global positioning system survey techniques described in Section 4.3 of the SAP (IT, 2000a) and conventional civil survey techniques described in Section 4.19 of the SAP (IT, 2000a). Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix D.

## **3.3 Analytical Program**

Samples collected during the SI were analyzed for various chemical and physical parameters. The specific suite of analyses performed was based on the potential site-specific chemicals historically at the site and EPA, ADEM, FTMC, and USACE requirements. Samples collected at

**Table 3-7**

**Surface Water and Sediment Sample Designations and QA/QC Samples  
Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)  
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Designation	Sample Depth (ft. bgs)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
PPMP-174-SW/SD01	PPMP-174-SW/SD01-SW-KU2001-REG	NA	PPMP-174-SW/SD01-SW-KU2002-FD	PPMP-174-SW/SD02-SW-KU2003-FS		TCL VOCs, TCL SVOCs, TAL Metals
	PPMP-174-SW/SD01-SD-KU1001-REG	0-0.5				TCL VOC/SVOC, TAL Metals, TOC, Grain size
PPMP-174-SW/SD02	PPMP-174-SW/SD02-SW-KU2004-REG	NA			PPMP-174-SW/SD02-SW-KU2004-MS PPMP-174-SW/SD02-SW-KU2004-MSD	TCL VOCs, TCL SVOCs, TAL Metals
	PPMP-174-SW/SD02-SD-KU1002-REG	0-0.5				TCL VOC/SVOC, TAL Metals, TOC, Grain size

FD - Field duplicate.

FS - Field split.

ft. bgs - feet below ground surface.

MS/MSD - Matrix spike/matrix spike duplicate.

QA/QC - Quality assurance/quality control.

SVOC - Semivolatile organic compound.

TAL - Target analyte list.

TCL - Target compound list.

TOC - Total organic carbon

VOC - Volatile organic compound.

the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), were analyzed for the following parameters:

- Target compound list VOCs – EPA Method 5035/8260B
- Target compound list semivolatile organic compounds (SVOC) – EPA Method 8270C
- Target analyte list metals – EPA Method 6010B/7000
- Total organic carbon (TOC) – EPA Method 9060 (sediment only)
- Grain size – American Society for Testing and Materials Method D421/D422 (sediment only).

The samples were analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Table 6-1 in Appendix B of the SAP (IT, 2000a). Data were reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of Appendix B of the SAP [IT, 2000a]). Chemical data were reported via hard-copy data packages by the laboratory using Contract Laboratory Program-like forms. These packages were validated in accordance with EPA National Functional Guidelines by Level III criteria. A summary of validated data is included in Appendix E. The data validation summary report is included as Appendix F.

### ***3.4 Sample Preservation, Packaging, and Shipping***

Sample preservation, packaging, and shipping followed requirements specified in Section 4.13.2 of the SAP (IT, 2000a). Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SI are listed in Chapter 5.0, Table 5-1, of Appendix B of the SAP (IT, 2000a). Sample documentation and chain-of-custody records were recorded as specified in Section 4.13 of the SAP (IT, 2000a).

Completed analysis request and chain-of-custody records (Appendix A) were secured and included with each shipment of sample coolers to Quanterra Environmental Services in Knoxville, Tennessee. Split samples were shipped to USACE South Atlantic Division Laboratory in Marietta, Georgia.

### **3.5 Investigation-Derived Waste Management and Disposal**

Investigation-derived waste (IDW) was managed and disposed as outlined in Appendix D of the SAP (IT, 2000a). The IDW generated during the SI at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), was segregated as follows:

- Drill cuttings
- Purge water from well development and sampling activities, and decontamination fluids
- Personal protective equipment (PPE).

Solid IDW was stored inside the fenced area surrounding Buildings 335 and 336 in lined roll-off bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure analyses. Based on the results, drill cuttings and PPE generated during the SI at the Small Weapons Storage and Cleaning Compound Building 1378, Parcel 174(7), were disposed as nonregulated waste at the Industrial Waste Landfill on the Main Post of FTMC.

Liquid IDW was contained in the existing 20,000-gallon sump associated with the Building T-338 vehicle washrack. Liquid IDW was characterized by VOC, SVOC, and metals analyses. Based on the analyses, liquid IDW was discharged as nonregulated waste to the FTMC wastewater treatment plant on the Main Post.

### **3.6 Variances/Nonconformances**

One variance to the SFSP was recorded during completion of the SI at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). The variance did not alter the intent of the investigation or the sampling rationale presented in Table 4-2 of the SFSP (IT, 1998a). The variance to the SFSP is summarized in Table 3-8 and included in Appendix G.

There were not any nonconformances to the SFSP recorded during completion of the SI at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7).

### **3.7 Data Quality**

The field sample analytical data are presented in tabular form in Appendix E. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI work plan; the FTMC SAP and installation-wide quality assurance plan; and standard, accepted methods and procedures. Sample collection logs pertaining to the collection of these samples were reviewed and organized for this report and are included in Appendix A. As discussed in

**Table 3-8**

**Variance to the Site-Specific Field Sampling Plan  
Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)  
Fort McClellan, Calhoun County, Alabama**

<b>Variance to the SFSP</b>	<b>Justification for Variance</b>	<b>Impact to Site Investigation</b>
Surface water and sediment samples were not collected at PPMP-174-SW/SD03.	The drainage did not contain surface water and sediment at the time of sample collection.	None. A depositional soil sample (PPMP-174-DEP01) was collected at the proposed PPMP-174-SW/SD03 sample location.

Section 3.6, one variance to the SFSP was recorded during completion of the SI; however, the variance did not impact the usability of the data.

**Data Validation.** A complete (100 percent) Level III data validation effort was performed on the reported analytical data. Appendix F consists of a data validation summary report that was prepared to discuss the results of the validation. Selected results were rejected or otherwise qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC IT Environmental Management System (ITEMS™) database for tracking and reporting. The qualified data were used in the comparisons to the SSSLs and ESVs developed by IT. Rejected data (assigned an “R” qualifier) were not used in comparisons to the SSSLs and ESVs. The data presented in this report, except where qualified, meet the principle data quality objective for this SI.



## **4.0 Site Characterization**

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Subsurface investigations performed at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), provided soil, bedrock, and groundwater data. These data were used to characterize the geology and hydrogeology of the site.

### **4.1 Regional and Site Geology**

#### **4.1.1 Regional Geology**

Calhoun County includes parts of two physiographic provinces, the Piedmont Upland Province and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold-and-thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold-and-thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted, with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults, and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992), and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group consists of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984) but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish-gray siltstone and mudstone. Massive to laminated, greenish-gray and black mudstone makes up the Nichols Formation, with thin interbeds of

siltstone and very fine-grained sandstone (Szabo et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies appears to dominate the unit and consists primarily of coarse-grained, vitreous quartzite, and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consists of sandy and micaceous shale and silty, micaceous mudstone which are locally interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation northeast, east and southwest of the Main Post and consists of interlayered bluish-gray or pale yellowish-gray sandy dolomitic limestone and siliceous dolomite with coarsely crystalline porous chert (Osborne et al., 1989). A variegated shale and clayey silt have been included within the lower part of the Shady Dolomite (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southwest of the Main Post as mapped by Warman and Causey (1962) and Osborne and Szabo (1984). The Rome Formation consists of variegated, thinly interbedded grayish-red-purple mudstone, shale, siltstone, and greenish-red and light gray sandstone, with locally occurring limestone and dolomite. The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962), (Osborne and Szabo, 1984) and the northern portion of the Main Post (Osborne et al., 1997). The Conasauga Formation is composed of dark-gray, finely to coarsely crystalline medium- to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989).

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weather to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone is comprised of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped together as undifferentiated at FTMC and other parts of Calhoun County. The Athens Shale overlies the Ordovician limestone units. The Athens Shale consists of dark-gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur within an eroded "window" in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post.

Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of various siltstones, sandstones, shales, dolomites and limestones, and are mapped as one, undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of interbedded red sandstone, siltstone, and shale with greenish-gray to red silty and sandy limestone.

The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with shale interbeds, dolomudstone, and glauconitic limestone (Szabo et al., 1988). This unit locally occurs in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark- to light-gray limestone with abundant chert nodules and greenish-gray to grayish-red phosphatic shale, with increasing amounts of calcareous chert toward the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian Age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale on the basis of fossil data.

The Jacksonville Thrust Fault is the most significant structural geologic feature in the vicinity of FTMC, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama and Piedmont, Alabama. The fault is

interpreted as a major splay of the Pell City fault (Osborne and Szabo, 1984). The Ordovician sequence that makes up the Eden thrust sheet is exposed at FTMC through an eroded "window," or "fenster," in the overlying thrust sheet. Rocks within the window display complex folding, with the folds being overturned and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formation, north by the Conasauga Formation, northeast, east, and southwest by the Shady Dolomite, and southeast and southwest by the Chilhowee Group (Osborne et al., 1997).

#### **4.1.2 Site Geology**

Soils in the area of the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), are mapped as the Rarden Series. The Rarden Series Soils consist of moderately well drained, strongly acid to very strongly acid soils. They generally occur in large areas on wide shale ridges. These soils have developed from the residuum of shale and fine-grained, platy sandstone or limestone. The series generally occurs as shallow soils found on gentle slopes and consists of yellowish-red to dark-brown silty clay loam. The soils in this series generally have slow infiltration rates, which results in high runoff, making the soil very susceptible to erosion (U.S. Department of Agriculture, 1961).

A geologic cross section was constructed using the direct-push and hollow-stem auger boring data collected during the SI and is presented on Figure 4-1. Description of the soil from the four direct-push and hollow-stem auger borings revealed a fill material consisting of a brownish, silty, sandy gravel covering most of the site to a depth of approximately 1 foot bgs. The soil beneath the fill material consists of a reddish-brown to reddish-gray, sandy silty clay approximately 5 to 7 feet thick. A 1- to 4-foot-thick gravelly silty sand interval is present immediately above bedrock. This sandy interval may represent past fluvial deposition.

The bedrock at the site is mapped as undifferentiated Mississippian/Ordovician Floyd and Athens Shale (Osborne et al., 1997). The Floyd and Athens Shale consists of brown, dark-gray to black shale with localized interbedded limestone and sandstone (Osborne et al., 1989). During temporary well installation activities at the site, gray shale was encountered in all four borings at depths from approximately 5 feet bgs to the bottom of each boring. Drilling logs for the two temporary wells and the two direct-push samples are presented in Appendix B.

DBILLING

c:\cadd\design\774645es.590

03/28/01 08:18:02 AM

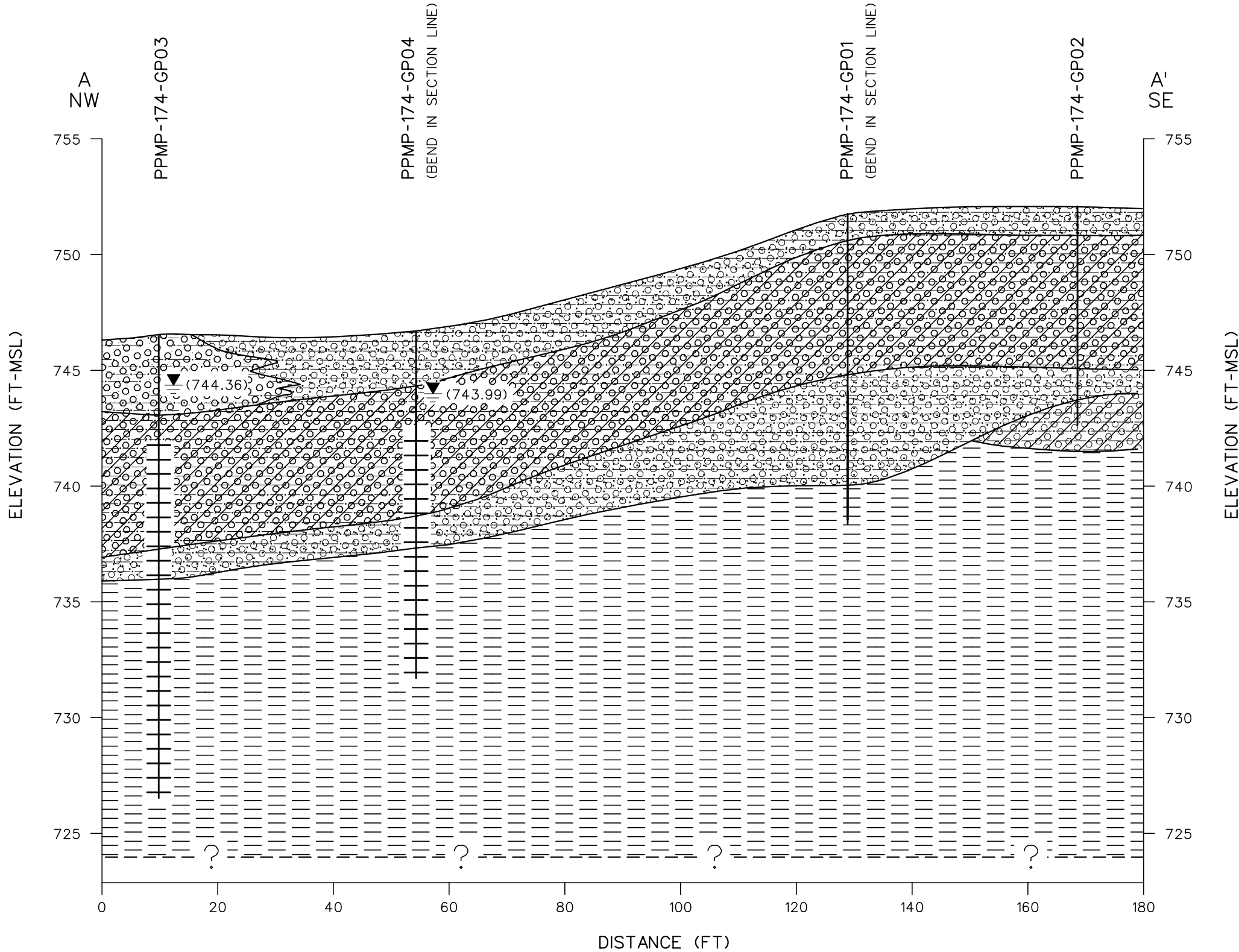
STARTING DATE: 08/15/00  
DRAWN BY: D. BILLINGSLEY

DATE LAST REV.:  
DRAWN BY:

DRAFT, CHECK, BY: ENGR, CHECK, BY: S. MORAN

INITIATOR: J. REMO  
PROJ. MGR.: J. YACOB

DWG. NO.: ... \774645es.590  
PROJ. NO.: 774645



LEGEND

SCREEN INTERVAL

WATER TABLE (3/14/00)

744.36

GROUNDWATER ELEVATION (FT MSL)

GRAVELLY, SILTY SAND

SILTY, SANDY GRAVEL

GRAVELLY, SILTY CLAY

WEATHERED SHALE

DASHED WHERE INFERRED

- NOTES:
1. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.

2. SEE FIGURE 3-1 FOR CROSS SECTION LOCATION.

3. PPMP-174-GP01 AND PPMP-174-GP02 ARE DIRECT-PUSH BORINGS.



FIGURE 4-1  
GEOLOGIC CROSS SECTION A-A'  
SMALL WEAPONS STORAGE AND  
CLEANING COMPOUND, BUILDING 1378  
PARCEL 174(7)

U. S. ARMY CORPS OF ENGINEERS  
MOBILE DISTRICT  
FORT McCLELLAN  
CALHOUN COUNTY, ALABAMA  
Contract No. DACA21-96-D-0018

## **4.2 Site Hydrology**

### **4.2.1 Surface Hydrology**

Precipitation in the form of rainfall averages about 54 inches annually in Anniston, Alabama, with infiltration rates annually exceeding evapotranspiration rates (National Oceanic and Atmospheric Administration, 1998). The major surface water features at the Main Post of FTMC include Remount Creek, Cane Creek, and Cave Creek. These waterways flow in a general northwest to westerly direction towards the Coosa River on the western boundary of Calhoun County.

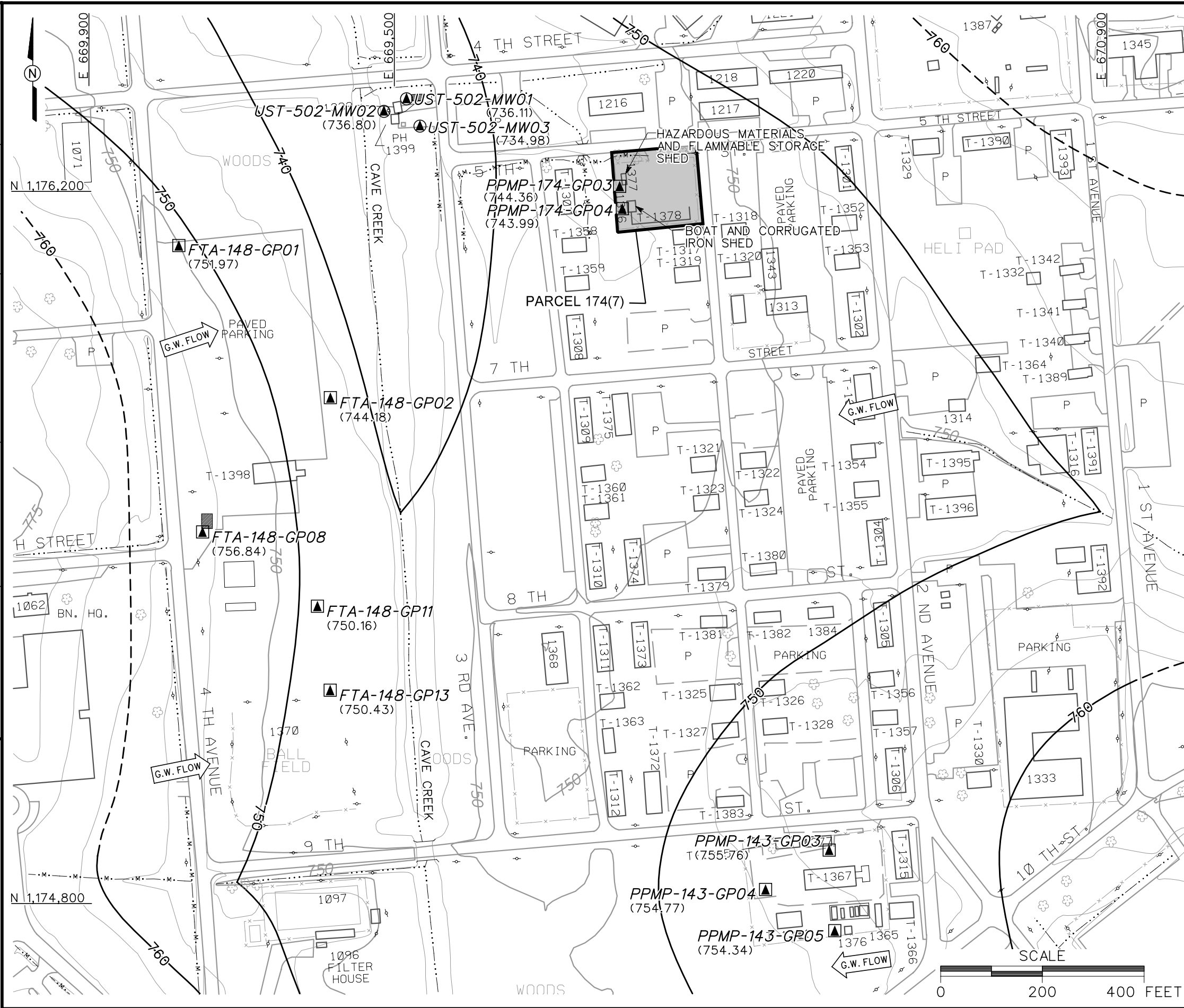
Elevation of the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), is approximately 750 feet above mean sea level. Surface drainage at the site follows the topography and flows to the west-northwest into man-made surface drainage features along the northern and western boundaries of the site. The man-made surface drainage features empty into Cave Creek just west of the parcel.

### **4.2.2 Hydrogeology**

During soil boring and well installation activities, groundwater was encountered between 10 and 12 feet bgs (Appendix B). Static groundwater levels were measured in monitoring wells at the site, and in wells at adjacent parcels on March 14, 2000 (Table 3-4). Groundwater elevations were calculated by measuring the depth to groundwater relative to the surveyed top-of-casing elevations. Figure 4-2 is a groundwater elevation map constructed from the March 2000 groundwater elevation data. Based on the groundwater elevation contour map, horizontal groundwater flow in the vicinity of the site is to the west. The hydraulic gradient across this area of FTMC is approximately 0.02 feet per foot.

Static groundwater levels summarized in the Table 3-4 are at shallower depths than the depth to groundwater encountered during drilling (Appendix B). This indicates that groundwater is under confined to semi-confined conditions and has an upward vertical hydraulic head.

DWG. NO.: ...774645es.591  
INITIATOR: J. REMO  
DRAFT. CHK. BY:  
STARTING DATE: 08/11/00  
03/29/01  
DBILLING  
c:\cadd\design\774645es.591  
PROJ. MGR.: J. YACOB  
ENGR. CHK. BY: S. MORAN  
DATE LAST REV.:  
DRAWN BY: D. BILLINGSLEY  
10:36:20 AM



### LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FEET)
- GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FT MSL) (MARCH 14, 2000)
- GROUNDWATER FLOW DIRECTION
- TREES / TREELINE
- PARCEL BOUNDARY
- CULVERT WITH HEADWALL
- SURFACE DRAINAGE / CREEK
- MANMADE SURFACE DRAINAGE FEATURE
- FENCE
- UTILITY POLE
- GROUNDWATER SAMPLE LOCATION
- GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION

### FIGURE 4-2

## GROUNDWATER ELEVATION MAP

## SMALL WEAPONS STORAGE AND

## CLEANING COMPOUND, BUILDING 1378

## PARCEL 174(7)

U. S. ARMY CORPS OF ENGINEERS  
MOBILE DISTRICT  
FORT McCLELLAN  
CALHOUN COUNTY, ALABAMA  
Contract No. DACA21-96-D-0018

SCALE  
0 200 400 FEET

**IT CORPORATION**  
A Member of The IT Group

## ***5.0 Summary of Analytical Results***

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The results of the chemical analysis of samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), indicate that metals, VOCs, and SVOCs have been detected in the various site media. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, the analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the on-going SIs being performed under the BRAC Environmental Restoration Program at FTMC.

Metal concentrations exceeding the SSSLs and ESVs were subsequently compared to metals background screening values (background concentrations) (SAIC, 1998) to determine if the metals concentrations are within natural background concentrations. Summary statistics for background metals samples collected at FTMC (SAIC, 1998) are included in Appendix H. Additionally, PAH concentrations in surface and depositional soils that exceeded the SSSLs and ESVs were compared to PAH background screening values. The PAH background screening values were derived from PAH analytical data from 18 parcels at FTMC that were determined to represent anthropogenic activity (IT, 2000b). PAH background screening values were developed for two categories of surface soils: beneath asphalt and adjacent to asphalt. The PAH background screening values for soils adjacent to asphalt are the more conservative (i.e., lower) of the PAH background values and are the values used herein for comparison.

Six compounds were quantified by both SW-846 Method 8260B (as VOC) and Method 8270C (as SVOC), namely, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 1,3-dichlorobenzene, 1,2-dichlorobenzene, hexachlorobutadiene, and naphthalene. Method 8260B yields a reporting limit of 0.005 milligram per kilogram (mg/kg), while Method 8270C has a reporting limit of 0.330 mg/kg, which is typical for a soil matrix sample. Because of the direct nature of the Method 8260B analysis and its resulting lower reporting limit, this method should be considered superior to Method 8270C when quantifying low levels (0.005 to 0.330 mg/kg) of these compounds. Method 8270C and its associated methylene chloride extraction step is superior, however, when dealing with samples that contain higher concentrations (greater than 0.330 mg/kg) of these compounds. Therefore, all data were considered, and none were categorically excluded. Data validation qualifiers were helpful in evaluating the usability of data, especially if calibration, blank contamination, precision, or accuracy indicator anomalies were encountered. The validation qualifiers and concentrations reported (e.g., whether concentrations were less than or greater than 0.330 mg/kg) were used to determine which analytical method was likely to return the more nearly accurate result.



The following sections and Tables 5-1 through 5-5 summarize the results of the comparison of detected constituents to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix E.

### **5.1 Surface and Depositional Soil Analytical Results**

Four surface soil samples and one depositional soil sample were collected for chemical analysis at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). Surface and depositional soil samples were collected from the upper 1 foot of soil at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs, ESVs, and background screening values (metals and PAHs), as presented in Table 5-1.

**Metals.** Twenty metals were detected in surface and depositional soil samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). The concentrations of five metals (aluminum, arsenic, chromium, iron, and manganese) exceeded SSSLs. Of these metals, only arsenic and iron at sample locations PPMP-174-DEP01 and PPMP-174-GP03 also exceeded their respective background concentrations. However, the arsenic and iron results were within the range of background values determined by SAIC (1998) (Appendix H).

Nine metals (aluminum, arsenic, chromium, iron, manganese, selenium, silver, vanadium, and zinc) were detected at concentrations exceeding ESVs. Of these metals, arsenic (PPMP-174-DEP01 and PPMP-174-GP03), iron (PPMP-174-DEP01 and PPMP-174-GP03), selenium (all sample locations), silver (PPMP-174-GP03), and zinc (PPMP-174-DEP01, PPMP-174-GP01, and PPMP-174-GP04) also exceeded their respective background concentration. However, with the exception of silver at one location (PPMP-174-GP03) and selenium at four locations, the concentrations of their metals that exceeded ESVs and the respective background concentration were within the range of background values determined by SAIC (1998) (Appendix H). The silver concentration (2.6 g/kg) at PPMP-174-GP03 exceeded the range of background values (0.019 mg/kg to 1.9 mg/kg). The selenium concentrations (1.4 mg/kg to 2.2 mg/kg) exceeded the range of background values (1.3 mg/kg).

**Volatile Organic Compounds.** Five VOCs (1,2,4-trimethylbenzene, 2-butanone, acetone, bromomethane, and methylene chloride) were detected in surface and depositional soil samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). The bromomethane results, methylene chloride results, and three of the five acetone results were flagged with a “B” data qualifier, signifying that these compounds were also detected in an

Table 5-1

**Surface and Depositional Soil Analytical Results**  
**Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)**  
**Fort McClellan, Calhoun County, Alabama**

(Page 1 of 4)

Parcel Sample Location Sample Number Sample Date Sample Depth (Feet)					PPMP-174 PPMP-174-DEP01 KU0011 9-Mar-99 0- 1					PPMP-174 PPMP-174-GP01 KU0001 29-Jan-99 0- 1				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>METALS</b>														
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	7.16E+03				YES	8.15E+03			YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	1.98E+01		YES	YES	YES	8.70E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	4.65E+01					5.28E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	7.50E-01					7.00E-01				
Calcium	mg/kg	1.72E+03	NA	NA	2.28E+03		YES			5.46E+03		YES		
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	2.05E+01				YES	1.50E+01	J			YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	4.70E+00	J				4.20E+00	J			
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	3.09E+01		YES			2.30E+01		YES		
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	3.68E+04		YES	YES	YES	2.68E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	3.85E+01					2.70E+01	J			
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	1.34E+03		YES			2.25E+03	J	YES		
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	2.38E+02				YES	1.21E+02	J			YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	6.60E-02	B				4.30E-02				
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	1.25E+01		YES			9.80E+00				
Potassium	mg/kg	8.00E+02	NA	NA	3.35E+02	J				4.23E+02	J			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	1.50E+00		YES		YES	1.50E+00		YES		YES
Silver	mg/kg	3.60E-01	3.91E+01	2.00E+00	ND					ND				
Sodium	mg/kg	6.34E+02	NA	NA	1.21E+02	B				7.17E+01	B			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	3.17E+01				YES	2.46E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	8.35E+01		YES		YES	5.27E+01	J	YES		YES
<b>VOLATILE ORGANIC COMPOUNDS</b>														
1,2,4-Trimethylbenzene	mg/kg	NA	3.88E+02	1.00E-01	ND					ND				
2-Butanone	mg/kg	NA	4.66E+03	8.96E-01	ND					6.50E-03	J			
Acetone	mg/kg	NA	7.76E+02	2.50E+00	8.90E-03	B				3.90E-02	J			
Bromomethane	mg/kg	NA	1.09E+01	NA	ND					ND				
Methylene chloride	mg/kg	NA	8.41E+01	2.00E+00	4.60E-03	B				2.70E-03	B			

Table 5-1

**Surface and Depositional Soil Analytical Results**  
**Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)**  
**Fort McClellan, Calhoun County, Alabama**

(Page 2 of 4)

Parcel Sample Location Sample Number Sample Date Sample Depth (Feet)					PPMP-174 PPMP-174-DEP01 KU0011 9-Mar-99 0-1					PPMP-174 PPMP-174-GP01 KU0001 29-Jan-99 0-1				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>SEMIVOLATILE ORGANIC COMPOUNDS</b>														
2-Methylnaphthalene	mg/kg	NA	1.55E+02	NA	ND					ND				
Acenaphthylene	mg/kg	8.91E-01	4.63E+02	6.82E+02	1.00E-01	J				9.70E-02	J			
Anthracene	mg/kg	9.35E-01	2.33E+03	1.00E-01	ND					5.30E-02	J			
Benzo(a)anthracene	mg/kg	1.19E+00	8.51E-01	5.21E+00	2.90E-01	J				8.20E-02	J			
Benzo(a)pyrene	mg/kg	1.42E+00	8.51E-02	1.00E-01	5.50E-01			YES	YES	1.60E-01	J		YES	YES
Benzo(b)fluoranthene	mg/kg	1.66E+00	8.51E-01	5.98E+01	7.10E-01					1.70E-01	J			
Benzo(ghi)perylene	mg/kg	9.55E-01	2.32E+02	1.19E+02	3.20E-01	J				9.10E-02	J			
Benzo(k)fluoranthene	mg/kg	1.45E+00	8.51E+00	1.48E+02	3.40E-01	J				1.80E-01	J			
Carbazole	mg/kg	NA	3.11E+01	NA	ND					ND				
Chrysene	mg/kg	1.40E+00	8.61E+01	4.73E+00	3.00E-01	J				1.10E-01	J			
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	2.00E+02	ND					ND				
Dibenz(a,h)anthracene	mg/kg	7.20E-01	8.61E-02	1.84E+01	7.50E-02	J				4.50E-02	J			
Fluoranthene	mg/kg	2.03E+00	3.09E+02	1.00E-01	3.30E-01	J			YES	9.70E-02	J			
Indeno(1,2,3-cd)pyrene	mg/kg	9.37E-01	8.51E-01	1.09E+02	3.50E-01	J				9.20E-02	J			
Phenanthrene	mg/kg	1.08E+00	2.32E+03	1.00E-01	9.50E-02	J				3.10E-02	J			
Pyrene	mg/kg	1.63E+00	2.33E+02	1.00E-01	3.00E-01	J			YES	9.20E-02	J			
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	9.30E-01	2.30E-01	J				6.50E-02	B			

Table 5-1

**Surface and Depositional Soil Analytical Results**  
**Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)**  
**Fort McClellan, Calhoun County, Alabama**

(Page 3 of 4)

Parcel Sample Location Sample Number Sample Date Sample Depth (Feet)					PPMP-174 PPMP-174-GP02 KU0003 29-Jan-99 0-1					PPMP-174 PPMP-174-GP03 KU0005 14-Jan-99 0-1					PPMP-174 PPMP-174-GP04 KU0009 14-Jan-99 0-1				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>METALS</b>																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	6.22E+03				YES	1.04E+04			YES	YES	1.01E+04			YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	3.80E+00			YES		1.58E+01	J	YES	YES	YES	8.30E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	3.36E+01					6.48E+01					3.81E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	4.90E-01	J				6.70E-01					7.30E-01				
Calcium	mg/kg	1.72E+03	NA	NA	3.15E+04		YES			9.58E+03		YES			4.22E+03		YES		
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	2.38E+01	J		YES	YES	2.00E+01				YES	1.54E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	2.60E+00	J				ND					ND				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	9.50E+00					2.40E+01		YES			2.90E+01		YES		
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	2.06E+04			YES	YES	4.25E+04		YES	YES	YES	2.82E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	1.34E+01	J				1.72E+01					1.42E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	1.63E+04	J	YES			1.79E+03		YES			3.25E+03		YES		
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	1.15E+02	J			YES	4.56E+02			YES	YES	1.29E+02				YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	4.00E-02					5.60E-02					3.40E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	7.70E+00					8.90E+00	J				1.49E+01		YES		
Potassium	mg/kg	8.00E+02	NA	NA	3.42E+02	J				4.18E+02	J				3.16E+02	J			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	9.00E-01		YES		YES	2.20E+00		YES		YES	1.40E+00		YES		YES
Silver	mg/kg	3.60E-01	3.91E+01	2.00E+00	ND					2.70E+00		YES		YES	1.80E+00		YES		
Sodium	mg/kg	6.34E+02	NA	NA	9.86E+01	B				6.55E+01	J				4.34E+01	J			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	2.66E+01				YES	1.18E+01				YES	8.10E+00				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	2.09E+01	J				4.56E+01	J	YES			7.13E+01		YES		YES
<b>VOLATILE ORGANIC COMPOUNDS</b>																			
1,2,4-Trimethylbenzene	mg/kg	NA	3.88E+02	1.00E-01	6.60E-03	J				ND					ND				
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	3.80E-03	J				ND					ND				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	2.20E-02	J				1.50E-02	B				1.70E-02	B			
Bromomethane	mg/kg	NA	1.09E+01	NA	ND					1.90E-03	B				1.90E-03	B			
Methylene chloride	mg/kg	NA	8.41E+01	2.00E+00	2.70E-03	B				2.80E-03	B				2.90E-03	B			

Table 5-1

**Surface and Depositional Soil Analytical Results**  
**Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)**  
**Fort McClellan, Calhoun County, Alabama**

(Page 4 of 4)

Parcel Sample Location Sample Number Sample Date Sample Depth (Feet)					PPMP-174 PPMP-174-GP02 KU0003 29-Jan-99 0- 1					PPMP-174 PPMP-174-GP03 KU0005 14-Jan-99 0- 1					PPMP-174 PPMP-174-GP04 KU0009 14-Jan-99 0- 1				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>SEMIVOLATILE ORGANIC COMPOUNDS</b>																			
2-Methylnaphthalene	mg/kg	NA	1.55E+02	NA	4.30E-02	J				ND					ND				
Acenaphthylene	mg/kg	8.91E-01	4.63E+02	6.82E+02	1.30E-01	J				5.80E-02	J				ND				
Anthracene	mg/kg	9.35E-01	2.33E+03	1.00E-01	8.70E-02	J				ND					ND				
Benzo(a)anthracene	mg/kg	1.19E+00	8.51E-01	5.21E+00	1.20E-01	J				4.40E-02	J				ND				
Benzo(a)pyrene	mg/kg	1.42E+00	8.51E-02	1.00E-01	2.10E-01	J		YES	YES	8.90E-02	J		YES		ND				
Benzo(b)fluoranthene	mg/kg	1.66E+00	8.51E-01	5.98E+01	3.00E-01	J				9.70E-02	J				ND				
Benzo(ghi)perylene	mg/kg	9.55E-01	2.32E+02	1.19E+02	5.80E-02	J				9.80E-02	J				ND				
Benzo(k)fluoranthene	mg/kg	1.45E+00	8.51E+00	1.48E+02	2.00E-01	J				7.80E-02	J				ND				
Carbazole	mg/kg	NA	3.11E+01	NA	5.00E-02	J				ND					ND				
Chrysene	mg/kg	1.40E+00	8.61E+01	4.73E+00	1.60E-01	J				6.70E-02	J				ND				
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	2.00E+02	ND					5.50E-02	B				4.90E-02	B			
Dibenz(a,h)anthracene	mg/kg	7.20E-01	8.61E-02	1.84E+01	ND					ND					ND				
Fluoranthene	mg/kg	2.03E+00	3.09E+02	1.00E-01	1.10E-01	J			YES	ND					ND				
Indeno(1,2,3-cd)pyrene	mg/kg	9.37E-01	8.51E-01	1.09E+02	7.50E-02	J				8.10E-02	J				ND				
Phenanthrene	mg/kg	1.08E+00	2.32E+03	1.00E-01	2.60E-02					ND					ND				
Pyrene	mg/kg	1.63E+00	2.33E+02	1.00E-01	1.10E-01	J			YES	5.10E-02	J				ND				
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	9.30E-01	ND					8.30E-02	B				1.00E-01	B			

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

<sup>a</sup> BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama*, July. For SVOCs, concentration listed is the background screening value for soils adjacent to asphalt as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

<sup>b</sup> Residential human health site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).

J - Result is greater than method detection limit but less than or equal to reporting limit.

mg/kg - Milligrams per kilogram

NA - Not available

ND - Not detected

Qual - Data validation qualifier

Table 5-2

**Subsurface Soil Analytical Results**  
**Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)**  
**Fort McClellan, Calhoun County, Alabama**

(Page 1 of 2)

Parcel Sample Location Sample Number Sample Date Sample Depth (Feet)				PPMP-174 PPMP-174-GP01 KU0002 29-Jan-99 9-12				PPMP-174 PPMP-174-GP02 KU0004 29-Jan-99 6-9				PPMP-174 PPMP-174-GP03 KU0008 14-Jan-99 1-3				PPMP-174 PPMP-174-GP04 KU0010 14-Jan-99 6-9			
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
<b>METALS</b>																			
Aluminum	mg/kg	1.36E+04	7.80E+03	1.51E+04		YES	YES	9.83E+03			YES	1.48E+04		YES	YES	7.38E+03			
Arsenic	mg/kg	1.83E+01	4.26E-01	4.50E+00			YES	4.80E+00			YES	5.30E+00			YES	6.30E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	8.15E+01				6.64E+01				8.36E+01				6.32E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	1.10E+00		YES		9.70E-01		YES		1.40E+00		YES		1.10E+00		YES	
Calcium	mg/kg	6.37E+02	NA	1.38E+03		YES		1.03E+03		YES		1.44E+04		YES		6.29E+02			
Chromium	mg/kg	3.83E+01	2.32E+01	1.55E+01	J			1.30E+01	J			2.60E+01			YES	1.62E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	1.57E+01				4.00E+00	J			ND				ND			
Copper	mg/kg	1.94E+01	3.13E+02	6.59E+01		YES		1.95E+01		YES		1.88E+01				1.42E+01			
Iron	mg/kg	4.48E+04	2.34E+03	3.98E+04			YES	2.70E+04			YES	3.47E+04			YES	4.16E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	1.98E+01	J			1.24E+01	J			1.49E+01				1.19E+01			
Magnesium	mg/kg	7.66E+02	NA	7.05E+03	J	YES		2.87E+03	J	YES		3.35E+03		YES		1.03E+03		YES	
Manganese	mg/kg	1.36E+03	3.63E+02	2.58E+02	J			3.50E+01	J			2.57E+02				7.44E+02			YES
Mercury	mg/kg	7.00E-02	2.33E+00	3.40E-02	J			2.50E-02	J			5.70E-02				3.20E-02	J		
Nickel	mg/kg	1.29E+01	1.54E+02	3.84E+01		YES		1.39E+01		YES		7.40E+00				1.43E+01		YES	
Potassium	mg/kg	7.11E+02	NA	5.54E+02	J			3.85E+02	J			9.92E+02		YES		2.75E+02	J		
Selenium	mg/kg	4.70E-01	3.91E+01	2.40E+00		YES		8.50E-01		YES		1.70E+00		YES		1.70E+00		YES	
Silver	mg/kg	2.40E-01	3.91E+01	ND				ND				2.20E+00		YES		2.60E+00		YES	
Sodium	mg/kg	7.02E+02	NA	1.09E+02	B			8.16E+01	B			1.23E+02	J			5.44E+01	J		
Thallium	mg/kg	1.40E+00	5.08E-01	ND				4.30E-01	B			ND				ND			
Vanadium	mg/kg	6.49E+01	5.31E+01	2.57E+01				3.31E+01				1.80E+01				ND			
Zinc	mg/kg	3.49E+01	2.34E+03	1.33E+02	J	YES		4.63E+01	J	YES		3.22E+01				3.52E+01		YES	
<b>VOLATILE ORGANIC COMPOUNDS</b>																			
Acetone	mg/kg	NA	7.76E+02	3.40E-02	J			3.80E-01	B			1.30E-01	J			1.80E+00	B		
Bromomethane	mg/kg	NA	1.09E+01	ND				ND				2.20E-03	B			1.80E-03	B		
Methylene chloride	mg/kg	NA	8.41E+01	3.00E-03	B			3.30E-03	B			3.40E-03	B			3.20E-03	B		
<b>SEMIVOLATILE ORGANIC COMPOUNDS</b>																			
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	ND				ND				6.70E-02	B			4.90E-02	B		
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	ND				6.90E-02	B			8.20E-02	B			2.00E-01	B		

**Table 5-2**  
**Subsurface Soil Analytical Results**  
**Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)**  
**Fort McClellan, Calhoun County, Alabama**

(Page 2 of 2)

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

<sup>a</sup> BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

<sup>b</sup> Residential human health site-specific screening level (SSSL) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).

J - Result is greater than method detection limit but less than or equal to reporting limit.

mg/kg - Milligrams per kilogram

NA - Not available

ND - Not detected

Qual - Data validation qualifier

Table 5-3

**Groundwater Analytical Results**  
**Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)**  
**Fort McClellan, Calhoun County, Alabama**

Parcel Sample Location Sample Number Sample Date				PPMP-174 PPMP-174-GP03 KU3001 24-Feb-99				PPMP-174 PPMP-174-GP04 KU3004 24-Feb-99			
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
<b>METALS</b>											
Aluminum	mg/L	2.34E+00	1.56E+00	7.81E-02	J			9.16E-02	J		
Arsenic	mg/L	1.78E-02	4.00E-05	3.40E-03	J		YES	ND			
Barium	mg/L	1.27E-01	1.10E-01	3.72E-02	J			2.72E-02	J		
Calcium	mg/L	5.65E+01	NA	1.99E+02		YES		1.20E+02		YES	
Iron	mg/L	7.04E+00	4.69E-01	1.12E+01		YES	YES	1.06E+00			YES
Magnesium	mg/L	2.13E+01	NA	1.80E+02		YES		1.03E+02		YES	
Manganese	mg/L	5.81E-01	7.35E-02	7.04E+00		YES	YES	8.70E+00		YES	YES
Mercury	mg/L	NA	4.60E-04	ND				6.30E-05	J		
Potassium	mg/L	7.20E+00	NA	9.52E-01	B			1.19E+00	B		
Sodium	mg/L	1.48E+01	NA	7.38E+01		YES		5.88E+01		YES	
<b>VOLATILE ORGANIC COMPOUNDS</b>											
1,2,3-Trichlorobenzene	mg/L	NA	1.32E-03	ND				3.00E-04	B		
1,2,4-Trichlorobenzene	mg/L	NA	1.35E-02	ND				2.00E-04	B		
Acetone	mg/L	NA	1.56E-01	ND				1.40E-03	B		
Naphthalene	mg/L	NA	3.00E-03	ND				5.70E-04	B		

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

<sup>a</sup> BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

<sup>b</sup> Residential human health site-specific screening level (SSSL) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).

J - Result is greater than method detection limit but less than or equal to reporting limit.

mg/L - Milligrams per liter

NA - Not available

ND - Not detected

Qual - Data validation qualifier



Table 5-4

**Surface Water Analytical Results**  
**Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)**  
**Fort McClellan, Calhoun County, Alabama**

Parcel Sample Location Sample Number Sample Date					PPMP-174 PPMP-174-SW/SD01 KU2001 27-Jan-99					PPMP-174 PPMP-174-SW/SD02 KU2004 8-Feb-99				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>METALS</b>														
Aluminum	mg/L	5.26E+00	1.53E+01	8.70E-02	3.70E-01				YES	7.21E-02	B			
Barium	mg/L	7.53E-02	1.10E+00	3.90E-03	2.90E-02	J			YES	3.71E-02	J			YES
Calcium	mg/L	2.52E+01	NA	1.16E+02	4.80E+01		YES			9.52E+01		YES		
Iron	mg/L	1.96E+01	4.70E+00	1.00E+00	4.10E-01					1.01E-01	B			
Magnesium	mg/L	1.10E+01	NA	8.20E+01	1.30E+01		YES			5.43E+01		YES		
Manganese	mg/L	5.65E-01	6.40E-01	8.00E-02	4.13E-02					9.62E-02				YES
Mercury	mg/L	NA	4.25E-03	1.00E-05	4.60E-05	J			YES	4.90E-05	B			YES
Potassium	mg/L	2.56E+00	NA	5.30E+01	1.70E+00	J				1.47E+00	B			
Sodium	mg/L	3.44E+00	NA	6.80E+02	3.26E+00	J				1.76E+01		YES		
Zinc	mg/L	4.03E-02	4.65E+00	5.89E-02	6.88E-02	J	YES		YES	ND				
<b>VOLATILE ORGANIC COMPOUNDS</b>														
Acetone	mg/L	NA	1.57E+00	7.80E+01	5.50E-03	J				2.10E-03	B			
Methylene chloride	mg/L	NA	1.42E-01	1.93E+00	8.00E-04	B				ND				

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

<sup>a</sup> BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

<sup>b</sup> Recreational site user human health site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).

J - Result is greater than method detection limit but less than or equal to reporting limit.

mg/L - Milligrams per Liter

NA - Not available

ND - Not detected

Qual - Data validation qualifier

Table 5-5

**Sediment Analytical Results**  
**Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7)**  
**Fort McClellan, Calhoun County, Alabama**

Parcel Sample Location Sample Number Sample Date Sample Depth (Feet)					PPMP-174 PPMP-174-SW/SD01 KU1001 27-Jan-99 0-0.5					PPMP-174 PPMP-174-SW/SD02 KU1002 8-Feb-99 0-0.5				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>METALS</b>														
Aluminum	mg/kg	8.59E+03	1.15E+06	NA	6.54E+03					3.06E+03				
Arsenic	mg/kg	1.13E+01	5.58E+01	7.24E+00	7.80E+00				YES	2.80E+00				
Barium	mg/kg	9.89E+01	8.36E+04	NA	2.59E+01					1.45E+01	J			
Beryllium	mg/kg	9.70E-01	1.50E+02	NA	7.40E-01					2.50E-01	J			
Calcium	mg/kg	1.11E+03	NA	NA	1.17E+03		YES			1.15E+04		YES		
Chromium	mg/kg	3.12E+01	2.79E+03	5.23E+01	3.38E+01		YES			8.60E+00				
Cobalt	mg/kg	1.10E+01	6.72E+04	5.00E+01	4.10E+00	J				2.30E+00	J			
Copper	mg/kg	1.71E+01	4.74E+04	1.87E+01	1.68E+01					8.90E+00				
Iron	mg/kg	3.53E+04	3.59E+05	NA	3.78E+04		YES			1.00E+04				
Lead	mg/kg	3.78E+01	4.00E+02	3.02E+01	1.83E+01					9.90E+00				
Magnesium	mg/kg	9.06E+02	NA	NA	1.68E+03		YES			6.52E+03		YES		
Manganese	mg/kg	7.12E+02	4.38E+04	NA	3.32E+02					8.61E+01				
Mercury	mg/kg	1.10E-01	2.99E+02	1.30E-01	1.90E-02	J				2.40E-02	B			
Nickel	mg/kg	1.30E+01	1.76E+04	1.59E+01	1.01E+01					4.60E+00	J			
Potassium	mg/kg	1.01E+03	NA	NA	3.29E+02	J				1.75E+02	J			
Selenium	mg/kg	7.20E-01	5.96E+03	NA	2.20E+00		YES			6.50E-01				
Sodium	mg/kg	6.92E+02	NA	NA	9.10E+01	B				5.82E+01	B			
Vanadium	mg/kg	4.09E+01	4.83E+03	NA	3.19E+01					1.18E+01				
Zinc	mg/kg	5.27E+01	3.44E+05	1.24E+02	7.77E+01		YES			3.63E+01				
<b>VOLATILE ORGANIC COMPOUNDS</b>														
Methylene chloride	mg/kg	NA	9.84E+03	1.26E+00	3.10E-03	B				6.50E-03	B			

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

<sup>a</sup> BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

<sup>b</sup> Recreational site user human health site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).

J - Result is greater than method detection limit but less than or equal to reporting limit.

mg/kg - Milligrams per kilogram

NA - Not available

ND - Not detected

Qual - Data validation qualifier

associated laboratory or field blank sample. The remaining analytical results were flagged with a “J” data qualifier, indicating that the results were greater than the method detection limit but less than the reporting limit.

The VOC concentrations in surface and depositional soils were below SSSLs and ESVs.

**Semivolatile Organic Compounds.** Seventeen SVOCs, including thirteen PAH compounds, were detected in surface and depositional soil samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). The di-n-butyl phthalate results and three of the four bis(2-ethylhexyl)phthalate results were flagged with a “B” data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample. The majority of the remaining results were flagged with a “J” data qualifier .

The concentrations of three PAH compounds (benzo[a]pyrene, fluoranthene, and pyrene) exceeded SSSLs and/or ESVs but were below PAH background values for soils adjacent to asphalt.

## **5.2 Subsurface Soil Analytical Results**

Four subsurface soil samples were collected for chemical analysis at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). Subsurface soil samples were collected at depths greater than 1 foot bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background screening values, as presented in Table 5-2.

**Metals.** Twenty-one metals were detected in subsurface soil samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). The concentrations of five metals (aluminum, arsenic, chromium, iron, and manganese) exceeded SSSLs. Of these metals, only aluminum at two locations (PPMP-174-GP01 and PPMP-174-GP03) also exceeded its background concentration. However, the aluminum results were within the range of background values determined by SAIC (1998) (Appendix H).

**Volatile Organic Compounds.** Three VOCs (acetone, bromomethane, and methylene chloride) were detected in subsurface soil samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). The bromomethane results, methylene chloride results, and two of the four acetone results were flagged with a “B” data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample. The acetone results at PPMP-177-GP01 and PPMP-177-GP03 were flagged with a “J”

data qualifier, indicating that the result was greater than the method detection limit but less than the reporting limit.

The VOC concentrations in subsurface soils were below SSSLs.

**Semivolatile Organic Compounds.** Two SVOCs (di-n-butyl phthalate and bis[2-ethylhexyl]phthalate) were detected in subsurface soil samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). The SVOC results were flagged with a “B” data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample.

The di-n-butyl phthalate and bis(2-ethylhexyl)phthalate concentrations were below SSSLs.

### **5.3 Groundwater Analytical Results**

Two temporary monitoring wells were sampled at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background screening values, as presented in Table 5-3.

**Metals.** Ten metals were detected in groundwater samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). The concentrations of three metals (arsenic, iron, and manganese) exceeded SSSLs. Of these metals, iron (PPMP-174-GP03) and manganese (both sample locations) also exceeded their respective background concentrations. However, the iron and manganese results were within the range of background values determined by SAIC (1998) (Appendix H).

**Volatile Organic Compounds.** Four VOCs (1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, acetone, and naphthalene) were detected in the groundwater sample collected at PPMP-174-GP04. The VOC results were flagged a “B” data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample.

The VOC concentrations in groundwater were below SSSLs.

**Semivolatile Organic Compounds.** SVOCs were not detected in the groundwater samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7).

#### **5.4 Surface Water Analytical Results**

Two surface water samples were collected for chemical analysis at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). The surface water sample locations are shown on Figure 3-1. Analytical results were compared to recreational site user human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-4.

**Metals.** Ten metals were detected in surface water samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). The metals concentrations in surface water were below SSSLs. The concentrations of five metals (aluminum, barium, manganese, mercury, and zinc) exceeded ESVs. Of these metals, only zinc at PPMP-174-SW/SD01 also exceeded its respective background concentration. However, the zinc result was within the range of background values determined by SAIC (1998) (Appendix H).

**Volatile Organic Compounds.** Two VOCs (acetone and methylene chloride) were detected in surface water samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). Acetone at PPMP-174-SW/SD02 and methylene chloride at PPMP-174-SW/SD01 were flagged with a “B” data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample. Acetone and methylene chloride are common laboratory contaminants.

The acetone and methylene chloride results were below SSSLs and ESVs.

**Semivolatile Organic Compounds.** SVOCs were not detected in the surface water samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7).

#### **5.5 Sediment Analytical Results**

Two sediment samples were collected for chemical and physical analyses at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). The samples were collected from the upper 0.5-foot of sediment at the sample locations shown on Figure 3-1. Analytical results were compared to recreational site user human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-5.

**Metals.** Nineteen metals were detected in the sediment samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7). The metals concentrations in sediments were below SSSLs. The arsenic concentration exceeded the ESV at one location (PPMP-174-SW/SD01) but was below its background concentration.

***Volatile Organic Compounds.*** Methylene chloride was detected in both of the sediment samples collected at the site. The methylene chloride results were flagged with a “B” data qualifier, signifying that methylene chloride was also detected in an associated laboratory or field blank sample. Methylene chloride is a common laboratory contaminant. The methylene chloride concentrations were below the SSSL and ESV.

***Semivolatile Organic Compounds.*** SVOCs were not detected in the sediment samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7).

***Total Organic Carbon.*** The sediment samples were analyzed for TOC content. TOC concentrations were 6,890 mg/kg to 9,390 mg/kg, as summarized in Appendix E.

***Grain Size.*** The results of grain size analysis are included in Appendix E.

## ***6.0 Summary and Conclusions and Recommendations***

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IT, under contract to USACE, completed an SI at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site at concentrations that present an unacceptable risk to human health or the environment. The SI at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), consisted of the sampling and analysis of four surface soil samples, one depositional soil sample, four subsurface soil samples, two groundwater samples, two surface water samples, and two sediment samples. In addition, two temporary monitoring wells were installed in the saturated zone to facilitate groundwater sample collection and provide site-specific geological and hydrogeological characterization information.

Chemical analyses of samples collected at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), indicate that metals, VOCs, and SVOCs were detected in the environmental media sampled. Analytical results were compared to the SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC. Additionally, metal concentrations exceeding SSSLs and ESVs were compared to media-specific background screening values (SAIC, 1998) and PAH concentrations exceeding SSSLs and ESVs in surface and depositional soils were compared to PAH background screening values (IT, 2000b).

The potential threat to human receptors is expected to be low. Although the site is projected to be transferred to the Alabama Army National Guard, the soils and groundwater data were screened against residential human health SSSLs to evaluate the site for possible unrestricted land reuse. In soils, the concentrations of aluminum (two subsurface soil samples), arsenic (two surface/depositional soil samples), and iron (two surface/depositional soil samples) exceeded SSSLs and their respective background concentrations. In groundwater, the concentrations of iron and manganese exceeded SSSLs and their respective background concentrations. However, the concentrations of these metals were within the range of background values determined by SAIC (1998) and do not pose an unacceptable risk to human health. The SVOC benzo(a)pyrene was detected in four surface/depositional soil samples at concentrations exceeding the SSSL but below the PAH background value. VOC concentrations in site media were below SSSLs.

Five metals (arsenic, iron, selenium, silver, and zinc) were detected in site media at concentrations exceeding ESVs and their respective background concentrations. However, with the exception of silver (2.6 mg/kg) at one surface soil sample location, and selenium (1.4 mg/kg to 2.2 mg/kg) at four locations, the concentrations of these metals were within the range of background values determined by the SAIC (1998). Three PAH compounds were detected in surface/depositional soil samples at concentrations exceeding ESVs but below PAH background values. The site is located within a well-developed area of the Main Post, consisting of buildings, gravel-covered areas, and roads, interspersed with limited grassy areas. Viable ecological habitat is presently limited and is not expected to increase in the future land use scenario. Based on the low levels of metals, VOCs, and SVOCs detected and the future land use of this site, the potential threat to ecological receptors is expected to be low.

Based on the results of the SI, past operations at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7), do not appear to have adversely impacted the environment. The metals and chemical constituents detected in site media do not pose an unacceptable risk to human health and the environment. Therefore, IT recommends “No Further Action” and unrestricted land reuse at the Small Weapons Storage and Cleaning Compound, Building 1378, Parcel 174(7).



## 7.0 References

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**ATTACHMENT 1**

**LIST OF ABBREVIATIONS AND ACRONYMS**

**List of Abbreviations and Acronyms**

2,4-D	2,4-dichlorophenoxyacetic acid	CFC	chlorofluorocarbon	EM	electromagnetic
2,4,5-T	2,4,5-trichlorophenoxyacetic acid	ch	inorganic clays of high plasticity	EM31	Geonics Limited EM31 Terrain Conductivity Meter
2,4,5-TP	silvex	CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine	EM61	Geonics Limited EM61 High-Resolution Metal Detector
3D	3D International Environmental Group	CK	cyanogen chloride	EOD	explosive ordnance disposal
Abs	skin absorption	cl	inorganic clays of low to medium plasticity	EODT	explosive ordnance disposal team
AC	hydrogen cyanide	Cl.	chlorinated	EPA	U.S. Environmental Protection Agency
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded	CLP	Contract Laboratory Program	EPC	exposure point concentration
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded	CN	chloroacetophenone	EPIC	Environmental Photographic Interpretation Center
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded	CNB	chloroacetophenone, benzene, and carbon tetrachloride	ER	equipment rinsate
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded	CNS	chloroacetophenone, chloropicrin, and chloroform	ESE	Environmental Science and Engineering, Inc.
ACGIH	American Conference of Governmental Industrial Hygienists	Co-60	cobalt-60	ESV	ecological screening value
ADEM	Alabama Department of Environmental Management	COC	chain of custody	Exp.	explosives
AEL	airborne exposure limit	COE	Corps of Engineers	E-W	east to west
AHA	ammunition holding area	Con	skin or eye contact	EZ	exclusion zone
AL	Alabama	CRL	certified reporting limit	FB	field blank
amb.	amber	CRZ	contamination reduction zone	FD	field duplicate
ANAD	Anniston Army Depot	Cs-137	cesium-137	FedEx	Federal Express, Inc.
APT	armor-piercing tracer	CS	ortho-chlorobenzylidene-malononitrile	FFE	field flame expedient
ASP	ammunition supply point	CSEM	conceptual site exposure model	Fil	filtered
ASR	Archives Search Report	ctr.	container	Flt	filtered
AST	aboveground storage tank	CWA	chemical warfare agent	FMP 1300	Former Motor Pool 1300
ASTM	American Society for Testing and Materials	CWM	chemical warfare material; clear, wide mouth	Foster Wheeler	Foster Wheeler Environmental Corporation
‘B’	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)	CX	dichloroformoxime	Frtn	fraction
BCT	BRAC Cleanup Team	D	duplicate; dilution	FS	field split
BEHP	bis(2-ethylhexyl)phthalate	DANC	decontamination agent, non-corrosive	ft	feet
BFB	bromofluorobenzene	°C	degrees Celsius	ft/ft	feet per foot
BG	Bacillus globigii	°F	degrees Fahrenheit	FTA	Fire Training Area
bgs	below ground surface	DCE	dichloroethene	FTMC	Fort McClellan
BHC	betahexachlorocyclohexane	DDD	dichlorodiphenyldichloroethane	g	gram
bkg	background	DDE	dichlorodiphenyldichloroethene	G-856	Geometrics, Inc. G-856 magnetometer
bls	below land surface	DDT	dichlorodiphenyltrichloroethane	G-858G	Geometrics, Inc. G-858G magnetic gradiometer
BOD	biological oxygen demand	DEH	Directorate of Engineering and Housing	gal	gallon
BRAC	Base Realignment and Closure	DEP	depositional soil	gal/min	gallons per minute
Braun	Braun Intertec Corporation	DI	deionized	GB	sarin
BTEX	benzene, toluene, ethyl benzene, and xylenes	DIMP	di-isopropylmethylphosphonate	gc	clay gravels; gravel-sand-clay mixtures
BTOC	below top of casing	DMMP	dimethylmethylphosphonate	GC	gas chromatograph
BW	biological warfare	DOD	U.S. Department of Defense	GC/MS	gas chromatograph/mass spectrometer
BZ	breathing zone; 3-quinuclidinyl benzilate	DP	direct-push	GFAA	graphite furnace atomic absorption
C	ceiling limit value	DPDO	Defense Property Disposal Office	gm	silty gravels; gravel-sand-silt mixtures
Ca	carcinogen	DPT	direct-push technology	gp	poorly graded gravels; gravel-sand mixtures
CCAL	continuing calibration	DQO	data quality objective	gpm	gallons per minute
CCB	continuing calibration blank	DRMO	Defense Reutilization and Marketing Office	GPR	ground-penetrating radar
CD	compact disc	DRO	diesel range organics	GPS	global positioning system
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	DS	deep (subsurface) soil	GS	ground scar
CERFA	Community Environmental Response Facilitation Act	DS2	Decontamination Solution Number 2	GSA	General Services Administration
CESAS	Corps of Engineers South Atlantic Savannah	E&E	Ecology and Environment, Inc.	GSBP	Ground Scar Boiler Plant
CG	carbonyl chloride (phosgene)	EBS	environmental baseline survey	GSSI	Geophysical Survey Systems, Inc.
		Elev.	elevation	GST	ground stain

**List of Abbreviations and Acronyms (Continued)**

GW	groundwater	mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils	OWS	oil/water separator
gw	well-graded gravels; gravel-sand mixtures	MHz	megahertz	oz	ounce
HA	hand auger	µg/g	micrograms per gram	PAH	polynuclear aromatic hydrocarbon
HCl	hydrochloric acid	µg/kg	micrograms per kilogram	Parsons	Parsons Engineering Science, Inc.
HD	distilled mustard	µg/L	micrograms per liter	Pb	lead
HDPE	high-density polyethylene	µmhos/cm	micromhos per centimeter	PCB	polychlorinated biphenyl
Herb.	herbicides	min	minimum	PCE	perchloroethene
HNO <sub>3</sub>	nitric acid	MINICAMS	miniature continuous air sampling system	PCP	pentachlorophenol
hr	hour	ml	inorganic silts and very fine sands	PDS	Personnel Decontamination Station
H&S	health and safety	mL	milliliter	PEL	permissible exposure limit
HSA	hollow-stem auger	mm	millimeter	Pest.	pesticide
HTRW	hazardous, toxic, and radioactive waste	MM	mounded material	PG	professional geologist
‘I’	out of control, data rejected due to low recovery	MOGAS	motor vehicle gasoline	PID	photoionization detector
ICAL	initial calibration	MPA	methyl phosphonic acid	PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
ICB	initial calibration blank	MR	molasses residue	POL	petroleum, oils, and lubricants
ICP	inductively-coupled plasma	MS	matrix spike	PP	peristaltic pump
ICS	interference check sample	mS/cm	millisiemens per centimeter	ppb	parts per billion
ID	inside diameter	MSD	matrix spike duplicate	PPE	personal protective equipment
IDL	instrument detection limit	msl	mean sea level	ppm	parts per million
IDLH	immediately dangerous to life or health	MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded	PPMP	Print Plant Motor Pool
IDW	investigation-derived waste	mV	millivolts	ppt	parts per thousand
IMPA	isopropylmethyl phosphonic acid	MW	monitoring well	PSSC	potential site-specific chemical
in.	inch	N/A	not applicable; not available	pt	peat or other highly organic silts
Ing	ingestion	NAD	North American Datum	PVC	polyvinyl chloride
Inh	inhalation	NAD83	North American Datum of 1983	QA	quality assurance
IP	ionization potential	NAVD88	North American Vertical Datum of 1988	QA/QC	quality assurance/quality control
IPS	International Pipe Standard	ND	not detected	QAP	installation-wide quality assurance plan
IRDMIS	Installation Restoration Data Management Information System	NE	no evidence; northeast	QC	quality control
ISCP	Installation Spill Contingency Plan	NFA	No Further Action	QST	QST Environmental Inc.
IT	IT Corporation	ng/L	nanograms per liter	qty	quantity
ITEMS	IT Environmental Management System <sup>TM</sup>	NGVD	National Geodetic Vertical Datum	Qual	qualifier
‘J’	estimated concentration	NIC	notice of intended change	‘R’	rejected; resample
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded	NIOSH	National Institute for Occupational Safety and Health	RCRA	Resource Conservation and Recovery Act
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded	No.	number	RDX	cyclonite
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes	NOAA	National Oceanic and Atmospheric Administration	ReB3	Rarden silty clay loams
K	conductivity	NR	not requested	REG	field sample
L	lewisite; liter	ns	nanosecond	REL	recommended exposure limit
LC <sub>50</sub>	lethal concentration for 50 percent of population tested	N-S	north to south	RFA	request for analysis
LD <sub>50</sub>	lethal dose for 50 percent of population tested	nT	nanotesla	RI	remedial investigation
l	liter	NTU	nephelometric turbidity unit	RL	reporting limit
LCS	laboratory control sample	O&G	oil and grease	RPD	relative percent difference
LEL	lower explosive limit	OD	outside diameter	RRF	relative response factor
LT	less than the certified reporting limit	OE	ordnance and explosives	RSD	relative standard deviation
max	maximum	oh	organic clays of medium to high plasticity	RTK	real-time kinematic
MDL	method detection limit	ol	organic silts and organic silty clays of low plasticity	SAD	South Atlantic Division
mg/kg	milligrams per kilogram	OP	organophosphorus	SAE	Society of Automotive Engineers
mg/L	milligrams per liter	ORP	oxidation-reduction potential	SAIC	Science Applications International Corporation
mg/m <sup>3</sup>	milligrams per cubic meter	OSHA	Occupational Safety and Health Administration	SAP	installation-wide sampling and analysis plan

**List of Abbreviations and Acronyms** (Continued)

sc	clayey sands; sand-clay mixtures
Sch.	schedule
SD	sediment
SDG	sample delivery group
SDZ	safe distance zone; surface danger zone
SEMS	Southern Environmental Management & Specialties, Inc.
SFSP	site-specific field sampling plan
SGF	standard grade fuels
SHP	installation-wide safety and health plan
SI	site investigation
SL	standing liquid
sm	silty sands; sand-silt mixtures
SM	Serratia marcescens
SOP	standard operating procedure
sp	poorly graded sands; gravelly sands
SP	sump pump
Sr-90	strontium-90
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSSL	site-specific screening level
STB	supertropical bleach
STEL	short-term exposure limit
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units
SU	standard unit
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA <i>Test Methods for Evaluating Solid Waste: Physical/Chemical Methods</i>
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TCA	trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofurans
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TERC	Total Environmental Restoration Contract
TIC	tentatively identified compound
TLV	threshold limit value
TN	Tennessee
TOC	top of casing; total organic carbon

TPH	total petroleum hydrocarbons
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TWA	time weighted average
UCL	upper confidence limit
UCR	upper certified range
‘U’	not detected above reporting limit
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USACMLS	U.S. Army Chemical School
USAMPS	U.S. Army Military Police School
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
UXO	unexploded ordnance
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd³	cubic yards

SAIC – Data Qualifiers, Codes and Footnotes, 1995 Remedial Investigation

N/A – Not analyzed

ND – Not detected

Boolean Codes

LT – Less than the certified reporting limit

Flagging Codes

9 – Non-demonstrated/validated method performed for USAEC

B – Analyte found in the method blank or QC blank

C – Analysis was confirmed

D – Duplicate analysis

I – Interfaces in sample make quantitation and/or identification to be suspicious

J – Value is estimated

K – Reported results are affected by interfaces or high background

N – Tentatively identified compound (match greater than 70%)

Q – Sample interference obscured peak of interest

R – Non-target compound analyzed for but not detected (GC/MS methods)

S – Non-target compound analyzed for and detected (GC/MS methods)

T – Non-target compound analyzed for but not detected (non GC/MS methods)

U – Analysis in unconfirmed

Z – Non-target compound analyzed for and detected (non-GC/MS methods)

Qualifiers

J – The low-spike recovery is low

N – The high-spike recovery is low

R – Data is rejected